SOIL SURVEY OF

VIRGIN RIVER AREA, NEVADA - ARIZONA

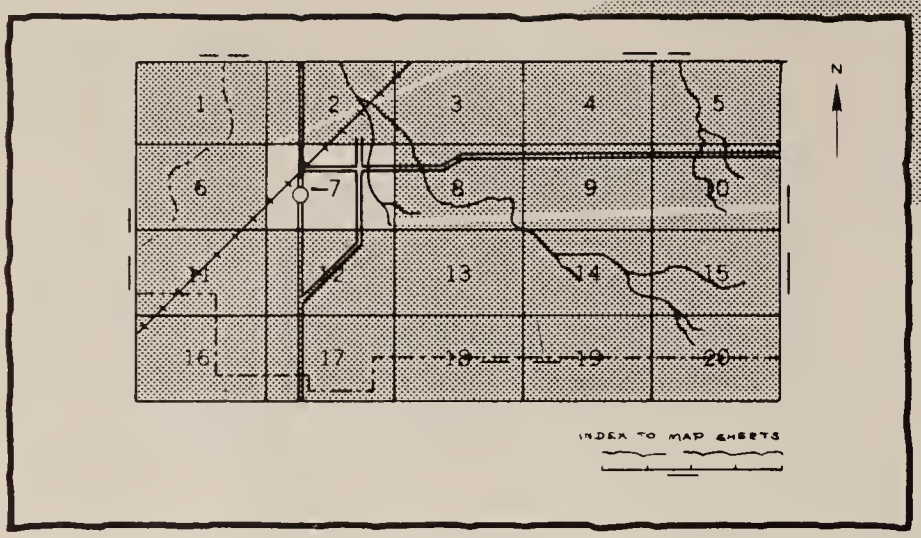
PARTS OF CLARK AND LINCOLN COUNTIES, NEVADA AND PART OF MOHAVE COUNTY, ARIZONA

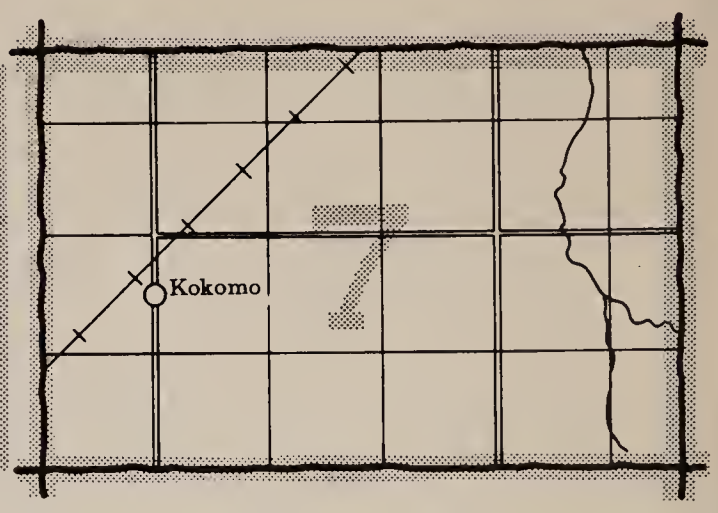
United States Department of Agriculture
Soil Conservation Service

In cooperation with
United States Department of the Interior
Bureau of Land Management
University of Nevada Agricultural Experiment Station
University of Arizona Agricultural Experiment Station

HOW TO USE

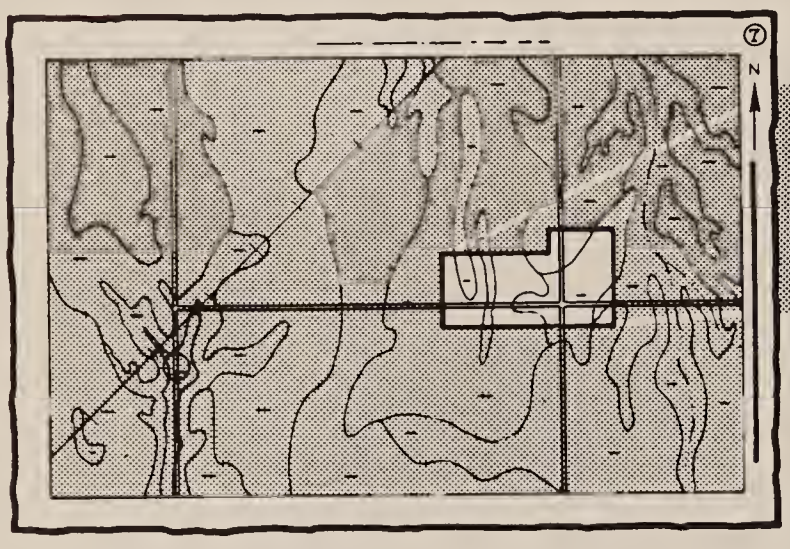
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

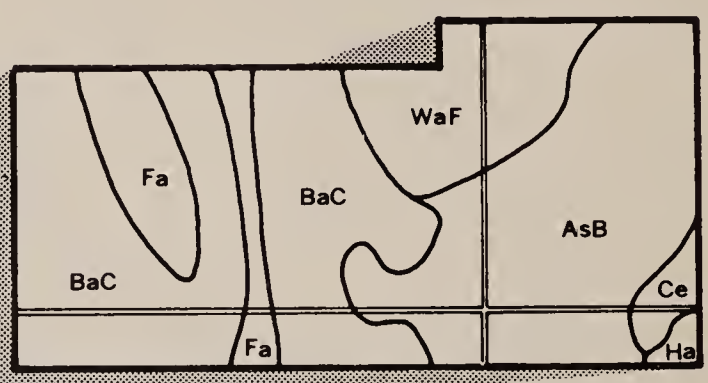




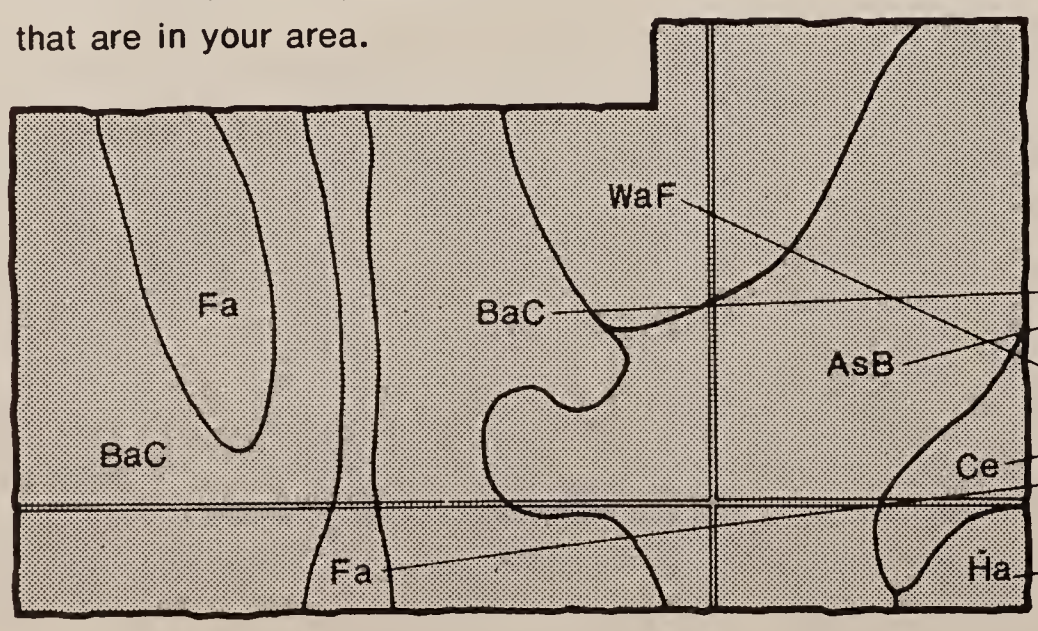
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





4. List the map unit symbols that are in your area.



Symbols

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BaC
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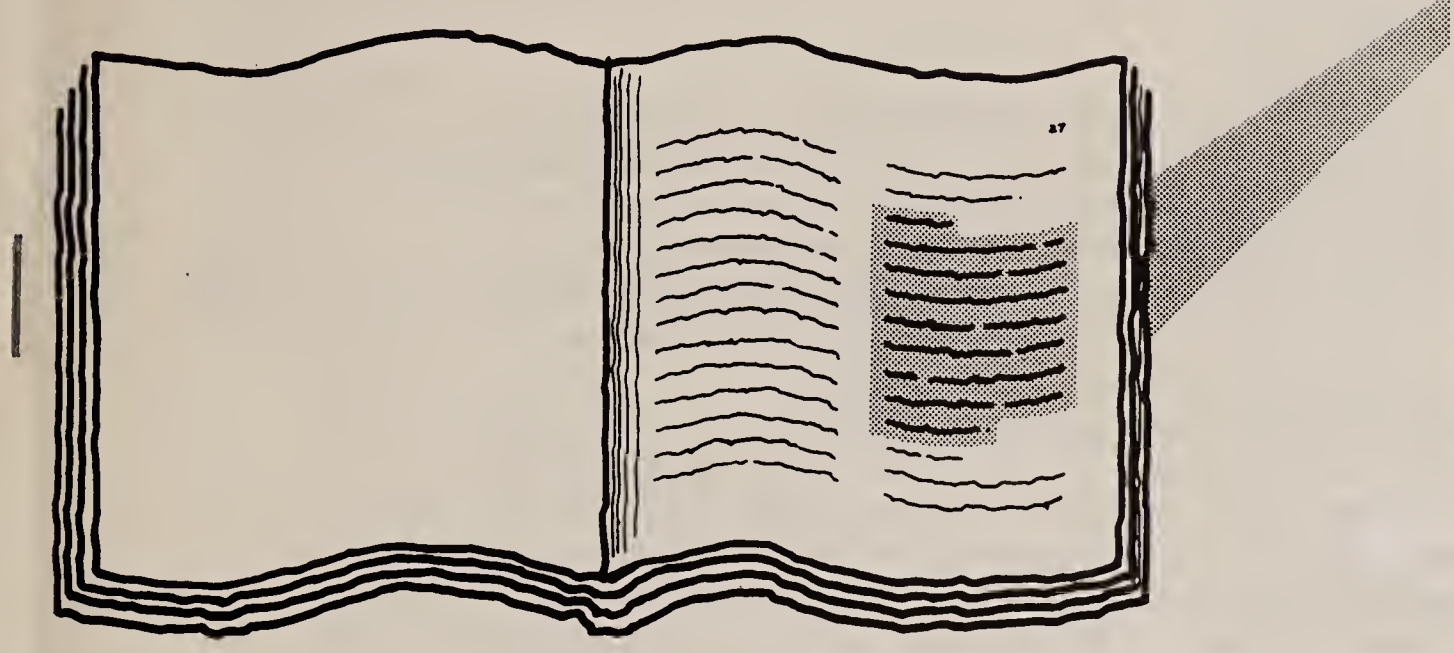
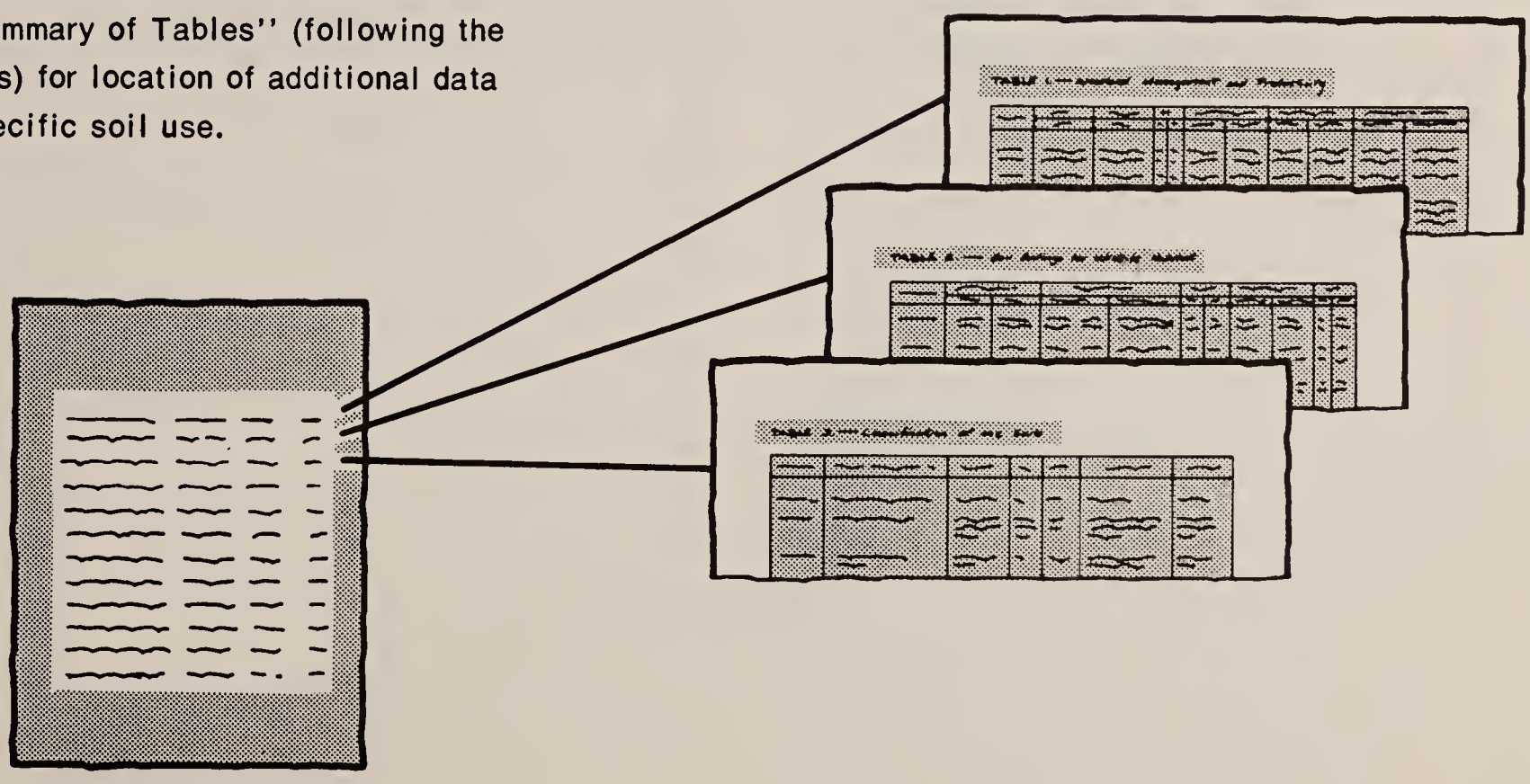
THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1957-65. Soil names and descriptions were approved in 1970. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1965. This survey was made cooperatively by the Soil Conservation Service, the University of Nevada Agricultural Experiment Station, and the University of Arizona Agricultural Experiment Station. It is part of the technical assistance furnished to the Clark County and Lincoln County Conservation Districts, Nevada, and the Littlefield-Hurricane Valley Natural Resource Conservation District, Arizona.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

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Issued July 1980

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Foreword

The Soil Survey of Virgin River Area contains much information useful in any land-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

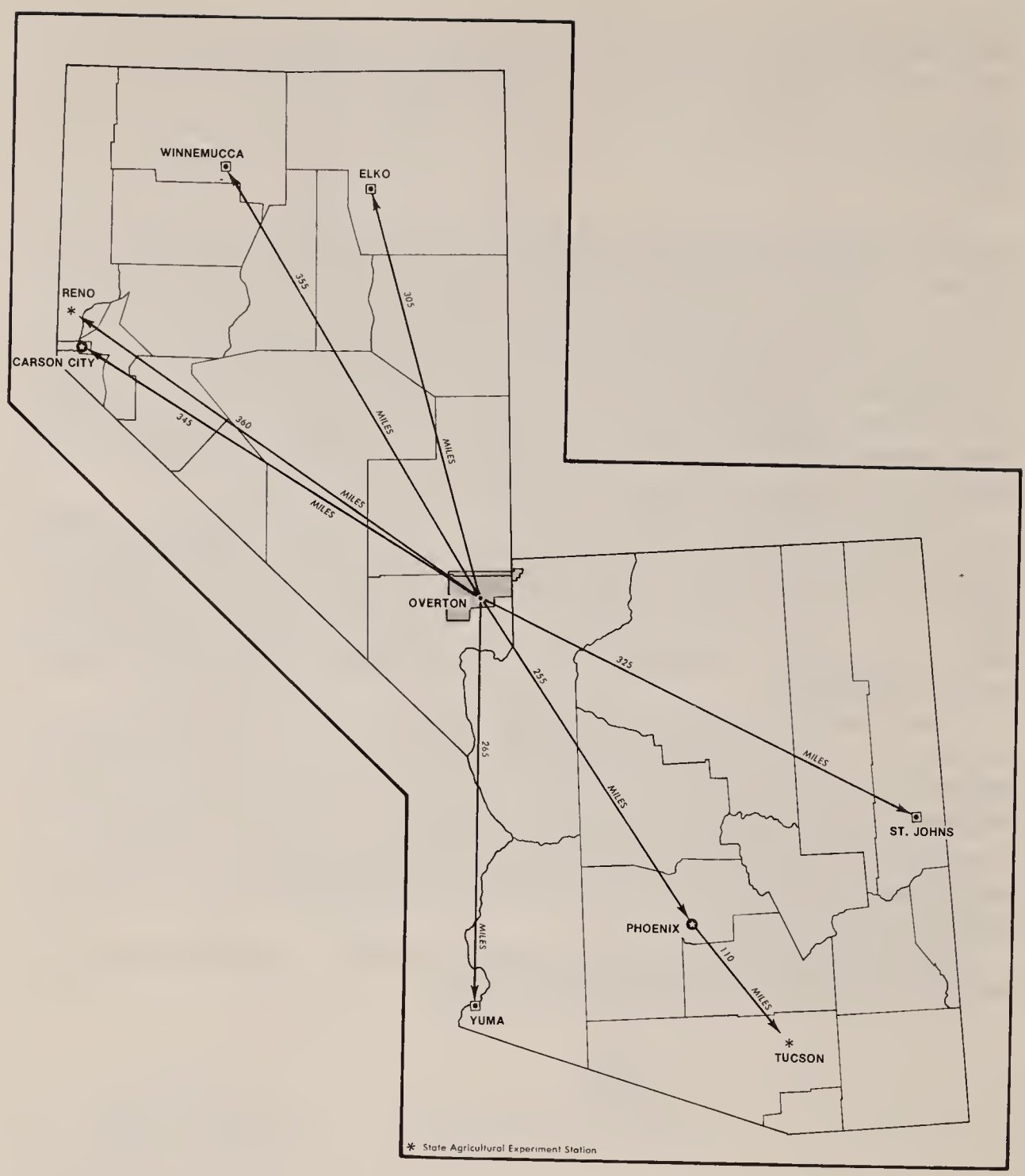
Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.

Gerald Thola

State Conservationist
Soil Conservation Service



Location of Virgin River Area in Nevada and Arizona.

SOIL SURVEY OF VIRGIN RIVER AREA, NEVADA - ARIZONA

Parts of Clark and Lincoln Counties, Nevada and Part of Mohave County, Arizona

By Donald G. Bagley, Soil Conservation Service

Fieldwork by V. Leavitt, G. Garlick, G. Woodruff, and D. Bagley, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service, in cooperation with
United States Department of the Interior, Bureau of Land Management
University of Nevada Agricultural Experiment Station and
University of Arizona Agricultural Experiment Station

VIRGIN RIVER AREA, Parts of Clark and Lincoln Counties, Nevada, and Part of Mohave County, Arizona (referred to elsewhere in this survey as Virgin River Area) (see facing page), is mainly in the northeastern corner of Clark County, Nevada. A small part of the Area extends north into Lincoln County, Nevada, and into Mohave County, Arizona. The survey area has a total land area of 1,068,616 acres, or about 1,669 square miles.

Most of the acreage in the survey area is used for limited livestock grazing, for recreation, and for esthetic purposes. About 10,000 acres, or about 1 percent of the survey area, is used for cultivated crops. Additional acreage could be used for crops, however, if water for irrigation were made available.

The farmed areas are on the flood plains and bottom lands of the two major streams—the Virgin River and the Muddy River. The Virgin River is a fairly reliable source of water because it is fed by snowpack in the higher watershed areas of Nevada and Utah. The Muddy River provides water to the Overton area. The flow of the Muddy River originates from a number of warm springs in the upper part of the Moapa Valley.

The elevation varies widely over the survey area. The lowest elevation, on the flood plains, is about 1,300 feet above sea level. The highest elevation, at the peak of the Virgin Mountains, is 8,075 feet.

The survey area consists of two major flood plains. The flood plains are flanked by a series of low alluvial fans, terraces, and benches that grade into higher alluvial fans. These fans intersect rolling to steep, high terraces, foothills, and uplands that give way to abruptly rising, very steep mountains.

The precipitation in the survey area ranges from 4 to 6 inches at the lower elevations to as much as 18 to 20 inches at the peaks of the mountains. Snow, though not common, occasionally falls, but it remains on the ground only for a short time. The growing season ranges from as little as 120 to 140 days in the mountains to about 240 days on the flood plains.

General nature of the area

This section briefly discusses the settlement and development, water supply, farming, transportation, and vegetation in the survey area. It also discusses drainage, physiography, and geology; community facilities; and climate.

Settlement and development

Ruins of prehistoric Indian settlements are scattered throughout the Moapa and Virgin Valleys. Archaeologists believe that the Indians in this area practiced primitive farming centuries before the birth of Christ. When the first explorers and settlers reached the area, they found it occupied by Indians who grew corn, beans, melons, pumpkins, and squash on small tracts of land. Evidence exists that the Indians used a primitive system of irrigated farming.

Modern farming methods were introduced into the area by settlers from Utah, who settled in the lower part of Moapa Valley in 1864. When the Nevada-Utah state line was established in 1871, the farmers abandoned their land and returned to Utah because of the resulting tax problems. The area was again settled in 1883.

The early settlers, isolated by lack of adequate transportation facilities, grew diverse crops. At one time a considerable acreage was devoted to cotton and to sugarcane for molasses. Changing conditions made these crops unprofitable. Alfalfa and small grain have been important crops in the past and are the major staple crops at present. The largest cash returns per acre have been derived from truck crops, but uncertain market prices probably account for the small acreage devoted to this kind of farming.

Commercial farming began with the extension of the railroad into the area in 1905. Rail transportation provided outlets in distant cities and towns for the farm products of the area. The accessibility of outside markets soon resulted in the practice of double cropping much of the land. Crops included in the double cropping system are tomato plants, radishes, green onions, and some lettuce in winter and spring followed by corn and other crops in summer and fall.

The land now farmed represents most of the irrigable land that can be cultivated without reclamation and the securing of additional water. Most of the remaining soils on the bottom lands and lower alluvial fans are impregnated with salts or have a water table within 3 feet of the surface, or both. Other areas of otherwise arable land have no feasible means of irrigation. Most of the farms are small, but some are as much as about 250 acres. Most of the farms are owner operated.

Many of the landowners maintain small herds of dairy cattle. Most of the milk is shipped out of the area into nearby Las Vegas.

The need for cropping systems that help to maintain the fertility and productivity of the soil was recognized early, and such systems were adopted as a common practice. The most common cropping system in the area consists of alfalfa followed by grain or row crops. Alfalfa is seeded in fall with grain as a nurse crop.

Most of the tilled land is highly productive. Little thought was given to the use of fertilizer by earlier farmers, but in recent years commercial fertilizer has come into common use. This has increased the production of alfalfa by as much as 2 tons per acre. The use of phosphate and manure on alfalfa has also been credited with lengthening the life of the stand by 1 or 2 years.

Water supply

The survey area is divided into two principal drainage systems. One is the Virgin River system, which drains from the southwestern edge of Utah and flows into Lake Mead. The other is the Muddy River system, which flows mostly from an area known as the Muddy Springs area in a southeasterly direction into Lake Mead. California Wash and Meadow Valley Wash drain into the Muddy River.

The source of the water in the Virgin River is the high plateaus and mountains of southwestern Utah and northwestern Arizona. In years of heavy snowfall an adequate supply of water is available during most of the growing season, but in years of light snowfall only a small amount is available. The quality of the water varies with the volume of the flow in the river. When the volume of the flow is low in summer and early in fall, the water is of poor quality. When the volume of the flow is high, and the quality of the water is good, it is feasible to apply excess water to the soils to remove accumulated salts.

Water for irrigation of the Littlefield, Arizona, area is diverted from the Virgin River. The water is used to irrigate a small area of cropland and then is returned to the river. In the Mesquite-Bunkerville area water is again diverted from the river and used to irrigate about 1,640 acres. All of the cropland is irrigated with water supplied through the distribution system of the irrigation company. The irrigation canal is about 6.4 miles long, and part of it has been lined with concrete. The capacity of the canal exceeds that required to satisfy the primary water right, but use of the canal at full capacity is allowed during periods of high streamflow in winter and spring. This permits annual leaching with water of satisfactory quality to remove excess salts from the soil profile and maintain a satisfactory balance of salt in the cultivated soils.

The Virgin River has a high content of sediment that is deposited in the canals and on the fields during periods of low flow. The canals must be cleaned periodically to remove these deposits. The sediment deposited on the cropland reduces the intake of irrigation water, and after a period of time the accumulation of sediment makes it desirable to relevel the fields.

The Muddy River drainage system consists of California Wash and Meadow Valley Wash. The water that flows into the Muddy River at a point below the Muddy Springs area is the major source of irrigation water for the upper and lower parts of Moapa Valley. The flow of the river from the springs to Lake Mead is perennial. The average annual discharge of the springs is about 46.5 cubic feet per second. Water in the river travels about 25 miles. A small amount of water is received through California Wash and the lower part of the Meadow Valley Wash during periods of high-intensity thunderstorms in summer.

The decreed rights of the Muddy River provide for irrigation water for about 500 acres of land in the upper part of Moapa Valley plus about 87 acres on the Moapa Indian Reservation. The lower part of the valley, by decree, is provided with irrigation water for 2,670 acres for the summer irrigation season and 4,541 acres for the winter season. According to the U.S. Bureau of Reclamation, in 1962 the irrigated lands included 840 acres in the upper part of the valley and 2,870 acres in the lower part of the valley. In the upper part of the valley, 526 acres is on the Moapa Indian Reservation and 314 acres is outside the reservation. In the lower part of the valley, an additional 2,150 acre-feet per year from the Muddy River was used for industrial and domestic purposes and about 1,400 acre-feet was used on 410 acres in the Overton wildlife management area. The Muddy River water, although highly saline, has been proved chemically acceptable for irrigation if good management is used and if the soil conditions are proper. (*4*)

Farming

Farming was the main reason that the Virgin River and Moapa Valleys were originally settled. In more recent times the Moapa Valley was noted for the production of early truck crops. Onions, asparagus, tomato plants, radishes, lettuce, and other crops were grown successfully until economic and social factors brought about a decline in production. Today, only a small acreage of truck crops is grown and the future looks quite dim for continued truck farming.

Cotton and sugar beet seed has also been successfully grown in the valleys, but little or no production is expected in the future. Sweet pomegranates, figs, and melons are very well suited to the valleys. A small number of pecan trees are grown, and there is some speculation that pistachio and macadamia nuts can also be grown.

Most of the irrigated cropland in the valleys is devoted to the production of livestock feed. The main crop is alfalfa hay. In this climate as many as six cuttings can be obtained each season. A yield of 8 tons of alfalfa for hay per acre per year is considered to be attainable under good management. The alfalfa for hay is consumed mostly by dairy cows and pleasure horses both in the valleys and in Las Vegas. Several large dairying operations ship milk to two local processing plants and to plants in California.

Among the field crops that are adapted to the survey area but that are not widely grown are corn, cotton, and sugar beets. Safflower can be grown as a winter annual. Soybeans are a suitable summer crop following cereal grain, but better adapted varieties are needed. Suitable vegetable crops are cantaloupe, peppers, tomatoes, celery, and lettuce. Some of these crops have been produced in the past, but lack of access to markets and processing plants has been a major limitation for their profitable production.

Transportation

The main line of the Union Pacific Railroad, which links Los Angeles, California, with Salt Lake City, Utah, passes through the survey area. The line enters the area in the very southwest corner and continues in a northeast direction through Dry Lake and Crystal, where it turns to the north and continues to Moapa. From Moapa the line follows the Meadow Valley Wash on to Caliente and then points toward the northeast. The communities of Logandale and Overton are connected by a branch line at Moapa. The line extends south of Overton and ends at the silica mine.

Trucklines and buslines connecting Las Vegas, Nevada, and St. George, Utah, cross the area via U.S. Highway 91. They, along with the railroads, provide ample transportation facilities for the populated parts of this survey area. The nearest important city from which airline connections can be made is Las Vegas, which is about 50 miles to the southwest. There is one well maintained airfield in the area, between Logandale and Overton and slightly to the east. This airfield can only accommodate small aircraft.

The area is well served by a network of paved or graded roads. The main route, U.S. Highway 91, is a multilane road that passes through the center of the area from the southwest to the northeast.

Vegetation

The native perennial vegetation in the survey area is characterized by a large number of species and is quite uniform over large areas, although the vegetation is sparse in most areas. Changes in vegetative type and aspect are closely associated with broad variations in elevation, relief, and precipitation.

Plants on the bottom lands along the rivers are mostly salt-tolerant species such as inland saltgrass, arrowweed pluchea, big saltbush, seepweed, and iodinebush. Along the bottom lands are trees such as tamarisk, honey mesquite, and screwbean mesquite. The density of these plants is high. In some places a single species occurs in a nearly pure stand, and in other places a mixture of two or three species occurs. A rather close correlation has been noted between the kind of vegetation present and the soil characteristics, such as salt content and available water capacity.

At intermediate elevations on uplands, where severe drought occurs, there is a marked but gradual change in plant composition. This change is based mainly on elevation as it affects precipitation. The most common species at the lower elevations, below about 3,000 feet, are creosotebush, white bursage, globemallow, and desert-trumpet. Most of the grass occurs in this zone. The main species of grass are big galleta and Indian ricegrass. One shrub species, sandpaper plant, grows in almost pure stands on soils that formed on beds of gypsite. The vegetation at the higher elevations, between 2,500 to 5,000 feet, consists of wolfberry, range ratany, Nevada ephedra, Mohave desertrue, Fremont dalea, several species of yucca and opuntica, and a wide variety of other, less abundant species.

The lower limit of the pinyon pine and juniper belt extends just inside the survey area, in the Mormon Mountains. The only evidence of this is a few scattered trees near Mormon Peak. At the higher elevations on the Virgin Mountains, blackbrush, Stansbury cliffrose, scattered pinyon pine, and juniper are dominant. Some scrub oak is present in places.

The number of annuals at the intermediate elevations is very large. These plants germinate during any period of the year if sufficient moisture is available. They have the capacity of springing up almost overnight, and their seasonal and yearly fluctuation in growth is very evident.

The most common species are annual brome, filaree, and deserttrumpet.

Drainage, physiography, and geology

The survey area is in the southwestern part of the Great Basin, within the Basin and Range physiographic province. It is an area of low-lying, alluvium-filled valleys surrounded by sharp, rugged mountain ranges. The area is dissected by four major drainageways—the California Wash, Muddy River, the lower part of Meadow Valley Wash, and the Virgin River.

The California Wash drains the southwestern part of the area. It flows northeast and enters the Muddy River near Glendale.

The Muddy River drains from the northwest and flows southeast. It is a segment of a topographic trough of the ancestral White River. The present source of water is the Muddy River springs area. The flow, which is perennial, is to Lake Mead.

The lower part of Meadow Valley Wash drains from north to south and is the southern extension of Meadow Valley. The lower part of Meadow Valley Wash enters the Muddy River near Glendale.

The Virgin River is a separate drainage system. It heads in southwestern Utah, passes through the northwest corner of Arizona, and flows southwest into Lake Mead. The California Wash and Meadow Valley Wash flow only in response to infrequent, sudden, high-intensity convection storms in summer.

The mountains in the survey area have a wide range in elevation. The Virgin Mountains have an altitude of more than 8,000 feet; the Mormon Mountains, to the north, reach an altitude of about 7,000 feet; and the Arrow Canyon Range and the Muddy Mountains, on the west and south sides of the area, are as high as 5,400 feet.

The mountain masses consist of complexly folded and faulted blocks of carbonate and noncarbonate rocks. The sedimentary formations in the mountain ranges consist mainly of limestone and mixtures of sandstone, shale, dolomite, gypsum, and some interbedded quartzite. Some volcanic activity has occurred and is responsible for the presence of basalt, rhyolite, and latite flows in some parts of the area.

Alluvial aprons join the mountains at an elevation of about 3,000 feet. The aprons are composed of many coalescing fans that have been dissected by numerous drainage channels. The upper boundary is clearly defined by the abrupt change in slope and the kind of rock material. The lower boundary is not so clearly defined, because the change from the apron to the valley fill is very gradual. Both the carbonate and the noncarbonate rocks that form the mountain masses underlie the older alluvium of the aprons at a relatively shallow depth. The upper reaches of the aprons are generally poorly sorted gravelly, cobbly, and stony material washed from the mountains. The material is finer textured and better sorted as it nears the valley floors. Deposition started in the late Tertiary period and is continuing at present. The aprons include both alluvial fans and pediments. The pediments are erosional surfaces cut in bedrock. They commonly are mantled with alluvium a few feet to several tens of feet thick. By contrast, the alluvial fans are underlain by thick deposits of alluvium deposited by runoff from the mountains.

The valley floor is positioned between the aprons and the flood plains of the drainage systems. It consists of older alluvium, much of which is lake-laid deposits of sand, silt, and clay. Lake activity influenced the valley filling process. Subsequent faulting of the valley fill has resulted in a series of scarps that range from a few feet to many feet in height. The Muddy Creek Formation, consisting of easily eroded silt and clay beds, is exposed on the faces of the scarps.

The flood plain consists mainly of younger alluvial deposits that have been transported by water, but some wind transported material is included on the gentle slopes of the low alluvial fans and flood plain. Deposition of the alluvium is continuing at the present time. In places intermittent streams that flow during sudden heavy storms are cutting into the flood plain and forming low terraces.

The four geomorphic units recognized in the area are the folded and faulted mountain ranges, the intermediate slopes below the mountains and slightly above the valley floor, the valley floor, and the low-lying flood plains of the drainage systems. The overall elevation of these units ranges from 1,150 feet at the rivers' confluence with Lake Mead to about 8,350 feet at the peak of the Virgin Mountains.

The rock in this survey area is divided into four lithologic units: noncarbonate rock, carbonate rock, older alluvium, and younger alluvium. This division is based largely on the hydrologic properties of the rock; however, the hydrologic properties of the rock may vary widely with differences in its physical and chemical properties.

The noncarbonate and carbonate rocks are from the mountain masses. They underlie both the older and the younger alluvium at some depth. The carbonate rock is Cambrian to Triassic in age and consists mostly of limestone and some dolomite. The carbonate rock commonly contains fractures and solution channels and therefore is probably capable of locally transmitting water through the mountain blocks from one basin to another. In contrast, the noncarbonate rock is generally of low permeability and does not readily convey ground water. Structural deformation may have increased or decreased the transmissibility of the consolidated rock, depending on a number of factors and conditions. Therefore, the present hydrologic characteristics of the rock may differ in some degree from those common to the rock at the time of its emplacement. Structural deformation generally is more complex and common in the consolidated rock than in

the valley fill deposits; however, deformation of some of the older alluvium has occurred and locally may have significantly altered its transmissive character.

The noncarbonate rock is Precambrian to Tertiary in age and consists mostly of volcanic flows and of tuff, gneiss, schist, granite, and sandstone. The noncarbonate rock is less susceptible to solution than the carbonate rock and generally is much less permeable.

The older alluvium is Cretaceous to Pleistocene in age and is composed mostly of clay, silt, sand, and gravel derived from debris washed from the adjacent mountains. It includes the Muddy Creek Formation, which contains abundant gypsum. The older alluvium covers much of the apron and valley floors. These deposits characteristically are semiconsolidated, dissected, poorly sorted, and locally deformed.

The younger alluvium, in contrast to the older alluvium, generally is unconsolidated, undissected, moderately well sorted, and commonly not deformed. It is Quaternary in age and is composed of sand, silt, and clay deposited by the principal streams on the flood plains, low alluvial fans, and low terraces. The younger alluvium also underlies the playa areas. These deposits are of late Pleistocene and Holocene age. The coarse-grained material of the younger alluvium probably is more porous and more permeable than the older alluvium (*3*).

Community facilities

The total population in the survey area is estimated not to exceed 5,000. There are seven small communities in the area. The larger communities, Mesquite, Logandale, and Overton, have an estimated population of 500 to 1,000. Moapa, Glendale, Bunkerville, and Littlefield each has a population of about 250. These estimates do not include tourists.

School facilities are available at Overton and Mesquite. The schools are modern and well staffed. Children are transported to school by bus.

The religious needs of most of the residents are adequately served. Churches are in Overton, Logandale, Bunkerville, and Mesquite.

A volunteer fireman group, a Chamber of Commerce, and several other organizations serve the area.

A branch of the Southern Nevada Memorial Hospital is maintained at Overton by the county. The hospital has limited medical facilities. A physician is also maintained at Overton by the county. A public health nurse also resides in Overton and Mesquite. There is no dental service available in the area. Complete hospital and dental facilities are available in either Las Vegas, Nevada, or St. George, Utah.

The communities have a supply of good-quality drinking water that is piped into the area from deep wells or from warm springs.

Electrical power, supplied through the local REA district, is available in the area. The power is generated at Hoover Dam.

Climate

Summers in the Virgin River Area are long and very hot. Winters are quite warm despite an occasional series of days when the nightly minimum temperature drops below freezing. Rainfall is scant in all months, most of the ground is bare, and irrigation is required for all crops.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Logandale, Nevada, in the western part of the area, for the period 1968 to 1975. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 46 degrees F and the average daily minimum is 31 degrees. The lowest temperature on record, 11 degrees, occurred at Beaver Dam, Arizona, on December 23, 1968. In summer, the average temperature is 87 degrees in the eastern part of the area and 84 degrees in the western part; the average daily maximum temperature is 104 degrees in the eastern part of the area and 102 degrees in the western part. The highest temperature, 118 degrees, was recorded at Beaver Dam on July 15, 1972.

Growing degree days, shown in table 1, are equivalent to "heat units." Beginning in spring, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 2 inches at Beaver Dam and 1 inch at Logandale, or 33 percent, usually falls during the period April through September, which includes the growing season for most crops. Two years in ten, the April-September rainfall is less than 2 inches at Beaver Dam and 1 inch at Logandale. The heaviest 1-day rainfall during the period of record was 1.63 inches at Beaver Dam on November 29, 1967. Thunderstorms number about 15 each year, 11 of which occur in summer.

Snowfall is rare. In 85 percent of the winters there is no measurable snowfall, and in 15 percent the snowfall is less than 3 inches at Beaver Dam and 5 inches at Logandale.

The average relative humidity in midafternoon is about 20 percent. Humidity is higher at night in all seasons, and the average at dawn is about 30 percent. The percentage of possible sunshine is 90 percent in summer and 80 percent in winter. The prevailing direction of the wind is from the southwest. Average windspeed is highest, 11 miles per hour, in April.

Strong, dry, dusty winds with gusts up to 75 miles per hour occur at times in summer and winter.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

After a guide for classifying and naming the soils was worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, roads, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it is readily available to different groups of users, among them farmers, managers of rangeland and woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

General soil map for broad land use planning

The general soil map at the back of this publication shows, in color, map units that have a distinct pattern of soils and of relief and drainage. Each map unit is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The kinds of soil in any one map unit differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

The general soil map at the back of this survey does not join, in all instances, with the general soil maps of adjacent survey areas. Differences in the maps have resulted from the differences in the occurrence of soil patterns and from recent advances in classification.

The map units in this survey have been grouped into three general kinds of landscape for broad interpretative purposes. Each of the broad groups and the map units in each group are described in the following pages.

Soils on flood plains, low alluvial fans, and low terraces

This group consists of three map units. It makes up about 6 percent of the survey area.

The soils in this group are dominantly along the Virgin River, Meadow Valley Wash, Muddy River, and the upper part of California Wash. They also are in Dry Lake Valley and extend in a long, narrow band from Hidden Valley north along the west side of the Arrow Canyon Range. Elevation is 1,200 to 3,000 feet. The average annual precipitation is 4 to 6 inches, the average annual temperature is 57 and 69 degrees F, and the frost-free season is 200 to 275 days.

The soils in this group are excessively drained, well drained, somewhat poorly drained, and very poorly drained. They formed in sandy, loamy, silty, and clayey alluvium derived from many kinds of rock and deposited

by wind and water. The surface layer is fine sand, fine sandy loam, loam, silt loam, silty clay, silty clay loam, and clay loam.

In most areas where irrigation water is available, this group is used as cropland. The main crops are alfalfa or grass hay, pasture, small grain, and row crops. Where irrigation water is not available, the soils are used for livestock grazing and wildlife habitat.

1. Glendale-Gila-Toquop

Deep, well drained and excessively drained, nearly level to moderately sloping soils; on flood plains, low stream terraces, and alluvial fans

This map unit is mainly on the western side of the survey area. It is dominantly in the upper part of California Wash, in Dry Lake Valley, and in Hidden Valley. It also extends northward in a narrow band along the west side of Arrow Canyon Range. Other areas are along the flood plain of Meadow Valley Wash. Elevation is about 1,700 feet to 3,000 feet. The average annual precipitation is 4 to 6 inches, the average annual temperature is 57 to 69 degrees F, and the frost-free season is more than 200 days.

This unit makes up about 3 percent of the survey area. Glendale soils make up about 38 percent of the unit, Gila soils 20 percent, and Toquop soils 18 percent. The remaining 24 percent is Ireteba soils; Alluvial land; Anthony, Vinton, and Bluepoint soils; and small areas of playa.

The Glendale soils are on flood plains and low stream terraces. They are deep, well drained, and nearly level. The surface layer is light brownish gray loam or fine sand about 8 inches thick. The underlying material to a depth of 60 inches or more is grayish brown, stratified silty clay loam and very fine sandy loam. These soils in places are salt affected. The vegetation on these soils is mainly creosotebush, white bursage, saltbush, big galleta, and Indian ricegrass.

The Gila soils are on flood plains and low stream terraces. These soils are deep, well drained, and nearly level to gently sloping. The upper part of the profile is pink fine sand or loam about 9 inches thick. The lower part to a depth of 60 inches or more is pink stratified silt loam to fine sandy loam. The vegetation on these soils is mainly creosotebush, white bursage, saltbush, arrowweed, screwbean mesquite, big galleta, and saltgrass.

The Toquop soils are on alluvial fans and terraces. These soils are deep, excessively drained, smooth, and nearly level to moderately sloping. The surface layer is pink fine sand or fine sandy loam about 9 inches thick. The underlying material to a depth of 60 inches or more is pink fine sand. The vegetation on these soils is mainly creosotebush, honey mesquite, Indian ricegrass, and annuals.

Where irrigation water is available, the unit is used as cropland. The main crops are alfalfa for hay, grasses and legumes for pasture, small grain, and row crops. Where water is not available, this unit is used for livestock grazing in sping and early in summer and for wildlife habitat. This unit is suited to all adapted crops if water for irrigation is made available.

This unit is not suited to range seeding, mainly because of the low precipitation.

This unit generally has very poor potential for developing food, water, and cover for rangeland, openland, and wetland wildlife. Where water is available, the potential for openland wildlife is fair. Areas of this unit can be made attractive for quail, dove, and pheasant. If water is made available, shallow water areas can be developed to attract ducks, geese, and other wetland wildlife. Management practices that provide food, water, and cover can help to attract more wildlife into the area.

2. Toquop-Calico-Overton

Deep, excessively drained, somewhat poorly drained, and very poorly drained, nearly level to moderately sloping soils; on flood plains, broad terraces, and alluvial fans

This unit is mainly along the major drainageways, including the Virgin River, Meadow Valley Wash, and the Muddy River. Elevation is about 1,400 feet to 2,500 feet. The average annual precipitation is 4 to 6 inches, the average annual temperature is 59 to 69 degrees F, and the frost-free season is about 240 days.

This unit makes up about 2 percent of the survey area. Toquop soils make up about 31 percent of the unit, Calico soils 20 percent, and Overton soils 14 percent. The remaining 35 percent is Riverwash; Alluvial land; and Anthony, Black Butte, Tobler, Bluepoint, and Grapevine soils.

The Toquop soils are on broad, smooth terraces and alluvial fans. These soils are deep, excessively drained, and nearly level to moderately sloping. The surface layer is pink fine sand about 9 inches thick. The underlying material to a depth of 60 inches or more is pink fine sand. The vegetation is mainly honey mesquite, creosotebush, Indian ricegrass, and annuals.

The Calico soils are on flood plains. These soils are deep, somewhat poorly drained, and nearly level. The surface layer is very pale brown fine sandy loam about 6 inches thick. The upper part of the underlying material is very pale brown stratified silt loam and fine sandy loam about 16 inches thick. The next part is light brownish gray, grayish brown, and light gray stratified silty clay to fine sandy loam about 21 inches thick. The lower part to a depth of 60 inches or more is very pale brown fine sand. The vegetation on these soils is mainly quailbush, arrowweed, mesquite, fourwing saltbush, and saltgrass.

The Overton soils are on flood plains. These soils are deep, very poorly drained, and nearly level. The surface layer is gray silty clay about 16 inches thick. The subsoil is light gray silty clay about 3 inches thick. The substra-

tum to a depth of 60 inches or more is pale yellow and light reddish brown silty clay and has thin strata of fine sandy loam. The vegetation on these soils is mainly quailbush, mesquite, fourwing saltbush, and saltgrass.

Most of this unit is used as cropland, for limited livestock grazing in spring and early in summer, and for wildlife habitat. The unit is suited to all adapted crops where water for irrigation is available.

The cropland in this unit is used for alfalfa for hay, grasses and legumes for pasture, small grain, and row crops.

This unit is not suited to range seeding, because of the low precipitation.

This unit has fair potential for rangeland wildlife. It can provide food and cover for coyote, rabbit, squirrel, and hawk and other birds. By providing watering facilities and using management that maintains or increases the amount of food and cover available, more rangeland wildlife can be attracted to the area. This unit has good potential for openland wildlife. It can provide good food and cover for quail, dove, and pheasant. The potential for wetland wildlife is good. Shallow water areas could be developed to attract duck, geese, and other wetland wildlife.

3. Toquop-Virgin River-Land

Deep, excessively drained and somewhat poorly drained, nearly level soils; on flood plains and broad, low terraces

This map unit is in the central point of the survey area. It consists of small areas along the main drainageways of the Virgin River and Meadow Valley Wash. Elevation is about 1,200 to 2,400 feet. The average annual precipitation is 4 to 6 inches, the average annual temperature is 62 to 70 degrees F, and the frost-free season is about 240 days.

This unit makes up about 1 percent of the survey area. Toquop soils make up about 42 percent of the unit, Virgin River soils 25 percent, and Land soils 10 percent. The remaining 23 percent is Alluvial land; Riverwash; and Grapevine soils.

The Toquop soils are on broad, smooth terraces and alluvial fans. These soils are deep, excessively drained and nearly level. The surface layer is pink fine sand about 9 inches thick. The underlying material to a depth of 60 inches or more is pink fine sand. The vegetation on these soils is mainly honey mesquite, creosotebush, Indian ricegrass, and annuals.

The Virgin River soils are on flood plains and low terraces. These soils are deep, somewhat poorly drained, and nearly level. The surface layer is light reddish brown silty clay about 6 inches thick. The underlying material is light reddish brown silty clay, clay loam, and clay about 29 inches thick. Below this to a depth of 60 inches or more is light reddish brown stratified fine sand to fine sandy loam. The vegetation on these soils is mainly quailbush, honey mesquite, fourwing saltbush, and saltgrass.

The Land soils are on the flood plains of the perennial streams. These soils are deep, somewhat poorly drained, and nearly level to gently sloping. The surface layer is grayish brown silty clay loam about 4 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray, grayish brown, light grayish brown, pale brown, and very pale brown, stratified silty clay to silt loam. The vegetation on these soils is mainly quailbush, arrowweed, fourwing saltbush, and saltgrass.

Less than half of this unit is used for cropland. Production generally is low because of the high content of salt in the soils. Alfalfa hay, grass-legume pasture, and small grain are suitable crops. Where irrigation water is not available, the unit is used for limited livestock grazing and for wildlife habitat.

This unit provides limited amounts of forage that is usable by livestock. It is not suited to rangeland seeding, because of the low precipitation and the high content of salt.

This unit has fair potential for rangeland, openland, and wetland wildlife. It can provide food and cover for rangeland wildlife, such as coyote, rabbit, squirrel, and hawk and other birds, and for openland wildlife, such as quail, dove, and pheasant. Shallow water areas can be developed to attract ducks, geese, and other wetland wildlife. Management practices that maintain or increase the availability of water, food, and cover can attract more wildlife into this area.

Soils on alluvial fans, dissected terraces, breaks, and low hills and on Mormon Mesa

This group consists of five map units. It makes up about 69 percent of the survey area.

This group is made up of large, irregularly shaped areas that are scattered throughout the survey area. Elevation is about 1,300 to 4,000 feet. The average annual precipitation is 4 to 6 inches, the average annual temperature is 57 to 69 degrees F, and the frost-free season is 200 to 275 days.

The soils in this group are well drained to excessively drained. They formed in sandy or loamy valley fill and material derived from mixed rock sources, mainly limestone, sandstone, and quartzite. The material in places is gravelly, stony, or cobbly. Some of the material has been deposited by wind, and the rest by water. The surface layer is fine sand, fine sandy loam, sandy loam, loamy sand, loam, and clay loam. Gravel and stones are present in some areas.

This group is used for livestock grazing and wildlife habitat. The soils are above the river systems, and water for irrigation is therefore not readily available. Some of

the soils would be suited to irrigated cropland if water for irrigation were made available.

4. Mormon Mesa-Flattop-Arada

Shallow to deep, well drained and somewhat excessively drained, nearly level to moderately sloping soils; on Mormon Mesa and on terraces and alluvial fans

This map unit consists of one large area and one smaller area in the central part of the survey area. These areas commonly are known as Mormon Mesa and Flattop Mesa. Elevation is about 2,000 feet to 3,000 feet. The average annual precipitation is 4 to 6 inches, the average annual temperature is 63 to 70 degrees F, and the frost-free season is about 240 days.

This unit makes up about 18 percent of the survey area. Mormon Mesa soils make up about 63 percent of the unit, Flattop soils about 11 percent, and Arada soils about 8 percent. The remaining 18 percent is Bard, Arizo, and Crystal Springs soils.

The Mormon Mesa soils are on old valley-fill terraces. These soils are shallow over an indurated, lime-cemented hardpan. They are well drained and nearly level to moderately sloping. The surface layer is light reddish brown fine sandy loam about 2 inches thick. The underlying material is reddish brown fine sandy loam about 14 inches thick over an indurated, lime-cemented hardpan. The vegetation on these soils is mainly white bursage, creosotebush, yucca, and big galleta.

The Flattop soils are on smooth alluvial fans. These soils are moderately deep, well drained, and gently sloping to moderately sloping. The surface layer is light brown gravelly clay loam about 2 inches thick. The subsoil is reddish brown clay loam about 3 inches thick. The next 17 inches is a buried subsoil that is yellowish red gravelly and very gravelly fine sandy loam. Below this to a depth of 60 inches is light brown and light reddish brown very gravelly loamy fine sand and very gravelly fine sand. The vegetation on these soils is mainly creosotebush, white bursage, cholla, yucca, and annuals.

The Arada soils are on terraces. These soils are deep, somewhat excessively drained, and nearly level to moderately sloping. The upper part of the profile is pink fine sand about 27 inches thick. The next part to a depth of 60 inches or more is pink gravelly loamy fine sand about 10 inches thick over pinkish white and very pale brown, stratified very gravelly fine sandy loam to very gravelly loamy coarse sand. The vegetation on these soils is mainly Indian ricegrass, big galleta, white bursage, creosotebush, and range ratany.

This unit is used for limited livestock grazing and wildlife habitat. It is poorly suited to crops because there is no available source of water for irrigation. Also, the soils are shallow over a hardpan or are gravelly, which greatly reduces the available water capacity.

This unit is not suited to range seeding because of the low precipitation.

This unit has very poor potential for rangeland, openland, and wetland wildlife habitat. It provides limited food, water, and cover for the wildlife species that normally inhabit the area.

5. Bard-Colorock-Tonopah

Moderately deep and deep, well drained and excessively drained, nearly level to strongly sloping soils; on broad alluvial fans and old terraces

This map unit consists of large areas, mainly in the western part of the survey area. It is characterized by mountain ranges and by depressional areas consisting of drainageways from the mountains. Elevation is 1,300 feet to 3,000 feet. The average annual precipitation is 4 to 6 inches, the average annual temperature is 63 to 68 degrees F, and the frost-free season is about 240 days.

This unit makes up about 31 percent of the survey area. Bard soils make up about 36 percent of the unit, Colorock soils about 24 percent, and Tonopah soils about 10 percent. The remaining 30 percent is Arizo, Arrolime, Cave, and St. Thomas soils and Badland.

The Bard soils are on old terraces and alluvial fans. These soils are shallow, have an indurated, lime-cemented hardpan, are well drained, and are gently sloping to strongly sloping. The surface layer is pink gravelly fine sandy loam about 5 inches thick. The underlying material is pink fine sandy loam about 14 inches thick over an indurated, lime-cemented hardpan. The vegetation on these soils is mainly creosotebush, white bursage, cholla and other cacti, and annuals.

The Colorock soils are on smooth, broad alluvial fans. These soils are shallow over a hardpan. They are well drained and gently sloping to moderately sloping. The upper part of the profile is pink very gravelly clay loam about 3 inches thick. The next layer is pink very gravelly sandy loam about 12 inches thick. Below this is an indurated, lime-cemented hardpan about 27 inches thick over light gray very gravelly sandy loam that extends to a depth of 60 inches or more. The vegetation on these soils is mainly creosotebush, white bursage, cacti, and annuals.

The Tonopah soils are on alluvial fans and terraces. These soils are deep, somewhat excessively drained, and nearly level to strongly sloping. The surface layer is light brown gravelly sandy loam about 6 inches thick. The underlying material to a depth of 60 inches or more is light brown very gravelly sand. The vegetation on these soils is mainly creosotebush, white bursage, and annuals.

This unit is used for limited livestock grazing and wildlife habitat.

This unit is not suited to crops. The soils are shallow over a hardpan or have a stony or cobbly surface. There is no readily available source of water for irrigation.

This unit is not suited to range seeding, because of the low precipitation.

This unit has very poor potential for rangeland, openland, and wetland wildlife. It provides limited food, water, and cover for wildlife species that normally inhabit the area.

6. Badland-Bard-Tonopah

Badland, and moderately deep and deep, well drained and excessively drained, nearly level to strongly sloping soils; on old terraces and alluvial fans

This map unit is mainly in the central part of the survey area. It consists of areas above the flood plains of the Virgin River, the Muddy River, and the Meadow Valley Wash and below Mormon Mesa. It is mainly along the terrace breaks. Elevation is 1,500 feet to 3,000 feet. The average annual precipitation is 4 to 6 inches, the average annual temperature is 61 to 71 degrees F, and the frost-free season is about 240 days.

This unit makes up about 9 percent of the survey area. Badland makes up about 53 percent of the unit, Bard soils 23 percent, and Tonopah soils 18 percent. The remaining 6 percent is Arizo, Arada, Cave, and Toquop soils.

Badland consists of severely eroded and gullied areas along the walls of the Virgin and Muddy Rivers. It is highly stratified deposits of silt and clay that contain a large amount of gypsum and calcium carbonate. Badland is strongly sloping to steep. Runoff is very rapid, and the hazard of erosion is high. It is barren and is so eroded that it has limited value for livestock grazing.

The Bard soils are on old terraces and alluvial fans. These soils are shallow over an indurated, lime-cemented hardpan. They are well drained and gently sloping to strongly sloping. The surface layer is pink gravelly fine sandy loam about 5 inches thick. The next layer is pink fine sandy loam about 14 inches thick. An indurated, lime-cemented hardpan is at a depth of 19 inches. The vegetation consists of creosotebush, white bursage, cholla and other cacti, and annuals.

The Tonopah soils are on alluvial fans and terraces. These soils are deep, somewhat excessively drained, and nearly level to strongly sloping. The surface layer is light brown gravelly sandy loam about 6 inches thick. Below this to a depth of 60 inches is light brown very gravelly sand. The vegetation on these soils is mainly creosotebush, white bursage, and annuals.

This unit is used for very limited livestock grazing and for wildlife habitat. It is not suited to range seeding, because of the low precipitation.

This unit is not suited to crops. There is no readily available source of irrigation water. Also, the large amount of Badland intermingled with the soils limits their use as cropland. The Badland is barren, and the soils produce very little usable forage.

This unit has very poor potential for rangeland, openland, and wetland wildlife habitat. It provides limited food, water, and cover for wildlife species that normally inhabit the area.

7. Nickel-Arizo-Bitter Spring

Deep, well drained and excessively drained, nearly level to steep soils; on alluvial fans and dissected terraces

This map unit is in the southeastern part of the survey area. It consists of a long narrow band near the base of the Virgin Mountains. Elevation is 1,400 to 4,000 feet. The average annual precipitation is 4 to 8 inches, the average annual temperature is 61 to 72 degrees F, and the frost-free season is about 200 days.

This unit makes up about 12 percent of the survey area. Nickel soils make up about 30 percent of the unit, Arizo soils about 25 percent, and Bitter Spring soils about 20 percent. Of the remaining 25 percent, about 20 percent is Weiser soils and 5 percent is Cave, Tonopah, and Bard soils.

The Nickel soils are on side slopes of dissected terraces. These soils are deep, well drained, and steep. The surface layer is pale brown gravelly sandy loam about 3 inches thick. Below this to a depth of 60 inches or more is light brown, white, and light brownish gray very gravelly sandy loam. The vegetation on these soils is mainly creosotebush, white bursage, yucca, cacti, and annuals.

The Arizo soils are on flood plains and recent alluvial fans. These soils are deep, excessively drained, and nearly level to moderately sloping. The surface layer is light brownish gray gravelly sand about 8 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray very gravelly and very cobbly sand. The vegetation on these soils is mainly creosotebush, white bursage, cholla, and annuals.

The Bitter Spring soils are on alluvial fans. These soils are deep, well drained, and nearly level to moderately sloping. The surface layer is pink very gravelly loam about 2 inches thick. The subsoil is light reddish brown sandy clay loam and sandy loam about 5 inches thick. The upper 7 inches of the substratum is pink gravelly sandy loam, and the lower part to a depth of 50 inches is light reddish brown very gravelly sandy loam. The vegetation on these soils is mainly creosotebush, white bursage, and cacti. Limited quantities of Indian ricegrass and alfileria grow after heavy rains in winter.

This unit is used for limited livestock grazing and for wildlife habitat.

This unit is not suited to use as cropland. There is no readily available source of water for irrigation.

This unit is not suited to range seeding because of the low precipitation.

This unit has very poor potential for rangeland, openland, and wetland wildlife habitat. It provides limited food, water, and cover for the wildlife species that normally inhabit the area.

8. Mormon Mesa-Badland-Arada

Shallow and deep, well drained and somewhat excessively drained, nearly level to moderately sloping soils; and Badland; on Mormon Mesa and on terraces and alluvial fans

This map unit is north of the Virgin River, in the Arizona part of the survey area. Elevation is 1,400 to 3,000 feet. The average annual precipitation is 4 to 6 inches, the average annual temperature is 61 to 66 degrees F, and the frost-free season is about 240 days.

This unit makes up about 1 percent of the survey area. Mormon Mesa soils make up about 42 percent of the unit, Badland about 35 percent, and Arada soils about 9 percent. The remaining 14 percent is Arizo and Tonopah soils and Rough broken land.

The Mormon Mesa soils are on old valley-fill terraces. These soils are shallow over an indurated hardpan. They are well drained and nearly level to moderately sloping. The surface layer is light reddish brown fine sandy loam about 2 inches thick. The underlying material is light reddish brown and reddish brown fine sandy loam about 14 inches thick over an indurated, lime-cemented hardpan. The vegetation on these soils is mainly white bursage, creosotebush, yucca, and some big galleta.

Badland consists of severely eroded and gullied areas on old terrace remnants of the Muddy Creek Formation. The Formation consists of highly gypsiferous and calcareous, stratified silt and clay. Areas of Badland commonly are barren. The vegetation on Badland is very sparse, and the hazard of erosion is high.

The Arada soils are on terraces. These soils are deep, excessively drained, and nearly level to moderately sloping. The surface layer is pink fine sand about 27 inches thick. The underlying material is pink gravelly loamy fine sand about 10 inches thick. Below this to a depth of 60 inches or more is pinkish white very gravelly sandy loam and very pale brown very gravelly loamy coarse sand. The vegetation on these soils is mainly Indian ricegrass, big galleta, white bursage, creosotebush, and range ratany.

This unit is used for limited livestock grazing and for wildlife habitat.

This unit is not suited to use as cropland. There is no readily available source of water for irrigation.

The soils are either shallow to a hardpan or are gravelly, which greatly reduces the available water capacity.

This unit is not suited to range seeding because of low precipitation.

This unit has very poor potential for rangeland, openland, and wetland wildlife habitat. It provides limited food, water, and cover for the wildlife species that normally inhabit the area.

Soils on mountains, foothills, and fans

This group consists of two map units. It makes up about 25 percent of the survey area.

The group is made up of fairly large, irregularly shaped areas that are mainly along the mountain ranges scattered throughout the survey area. Elevation is 2,500 feet to slightly more than 8,000 feet. The average annual precipitation is 4 to 16 inches, the average annual temperature is 53 to 69 degrees F, and the frost-free season is 120 to 200 days.

The soils in this group are well drained. They formed in alluvium and residuum derived from limestone, sandstone, shale, quartzite, and chert and from weathered metamorphic rock such as gneiss and schist. Some of the material has been reworked by wind and is sandy. The surface layer is fine sand, sandy loam, and loam.

The soils in this group are high above the river systems and therefore have no readily available source of water for irrigation. Some small seeps and springs originate in the higher parts of the mountains.

This group is used for livestock grazing, wildlife habitat, and watershed.

9. Rock land-St. Thomas

Rock land, and shallow, well drained, moderately steep to very steep soils; on mountains and colluvial foothills

This unit consists of large, irregularly shaped areas that are scattered throughout the survey area. It includes most of the mountainous terrain and the lower elevations of the Virgin Mountains. Elevation is 2,000 to 6,000 feet. The average annual precipitation is 4 to 8 inches, the average annual temperature is 60 to 67 degrees F, and the frost-free season is about 200 days.

This unit makes up about 20 percent of the survey area. Rock land makes up about 55 percent of the unit and St. Thomas soils about 25 percent. The remaining 20 percent is Weiser, Moapa, Arizo, and Garr soils and Rock outcrop.

The Rock land consists of areas that have exposures of limestone. In some areas soil material covers the bedrock. These areas are mostly barren.

The St. Thomas soils are on foothills and mountains. These soils are shallow, well drained, and moderately steep to very steep. The surface layer is very pale brown cobbly loam about 2 inches thick. The underlying material is very pale brown very cobbly loam about 10 inches thick over unweathered limestone. The vegetation on these soils is mainly white bursage, creosotebush, and annuals, including alfileria, cheatgrass, and buckwheat.

This unit is used for limited livestock grazing and for wildlife habitat.

This unit is not suitable for range seeding, because of low precipitation. The steepness of slope and the amount of Rock land and Rock outcrop limit its use by livestock.

This unit has very poor potential for rangeland, openland, and wetland wildlife habitat. It provides limited food, water, and cover for the wildlife species that normally inhabit the area.

10. Virgin Peak-Rock land

Shallow and deep, well drained, steep to very steep soils, and Rock land; on mountains

This map unit consists of two irregularly shaped areas in the Virgin Mountains, in the southeastern corner of the survey area. Elevation is 4,800 feet to a little more than 8,000 feet. The average annual precipitation is 12 to 20 inches, the average annual temperature is 51 to 56 degrees F, and the frost-free season ranges from 120 days to more than 160 days.

This unit makes up about 3 percent of the survey area. Virgin Peak soils make up about 50 percent of the unit and Rock land 30 percent. The remaining 20 percent is Garr, Pulsipher, Arizo, and Weiser soils, and Rock outcrop.

The Virgin Peak soils are on mountains. These soils are shallow, well drained, and steep to very steep. The surface layer is brown very gravelly loam about 6 inches thick over weathered gneiss bedrock that grades to unweathered, extremely hard gneiss bedrock at a depth of 14 inches. The vegetation on these soils is mainly big sagebrush, cliffrose, blue grama, and needleandthread. There is some scattered pinyon pine, juniper, and turbinella oak.

The Rock land consists of areas that have exposures of gneiss. In some areas soil material covers the bedrock. These areas are mostly barren.

This unit is used for limited livestock grazing and for wildlife habitat.

This unit is not suitable for use as cropland. It has no readily available source of water for irrigation. In addition, the soils are either too steep or too shallow to be used for cropland.

This unit is not suited to range seeding, because of the slope and shallow depth.

This unit is well suited to rangeland wildlife habitat. It is very poorly suited to habitat for openland and wetland wildlife. Good food and cover can be provided for deer, coyote, rabbit, squirrel, and hawk and other birds. Providing watering facilities and using management that maintains or improves the food and cover help to attract wildlife to the area.

Broad land use considerations

The soils in the Virgin River area vary widely in their potential for major land uses such as cropland, rangeland, wildlife habitat, and urban development. Extensive changes in land use are not expected within the foreseeable future. Such changes can only be accomplished with great difficulty and at great cost.

The soils on the flood plains, low alluvial fans, and low terraces along the major stream systems are used mainly as cropland. They support some grazing, provide most of the wildlife habitat, and have been subject to most of the urban development that has taken place.

The cultivated part of the survey area totals about 10,000 acres. All cropland in this area must be irrigated, either by water supplied from the rivers or pumped from wells. The supply of water from the rivers and from springs is not adequate to permit additional acreage of land to be used as cropland. Any additional land that is used for the production of irrigated crops will need to be supplied with a source of well water. Irrigation from wells could likely increase the acreage of cropland by 10 to 15 percent. Ground water supplies may not be totally reliable or of quality suitable for crops. Much of the water is not suitable for domestic use.

The hazard of flooding along the flood plains is also a limitation for most uses. Many of these soils have a water table at a depth of 18 to 72 inches and are without suitable drainage. This affects their use as cropland as well as for urban development. Sanitary facilities on these soils are a hazard to health because of the possibility of polluting the ground water.

The soils on the alluvial fans, terrace breaks, and mesa tops, as well as those on the uplands and mountainsides, are used for limited livestock grazing and for wildlife habitat. The soils receive about 4 to 6 inches of precipitation and produce a desert shrub plant community that supplies limited forage for livestock. Little improvement can be made in the kind or amount of forage produced. Seeding is not practical where the precipitation is much less than 12 inches.

These areas have no source of irrigation water. A few low-yield wells have been drilled to supply water for livestock. Most of the stock water is supplied by trucking water to stock troughs. The lack of a supply of good quality water severely limits the use of these soils as cropland or for urban development. Many of the soils are poorly suited to these uses because of soil characteristics such as depth to the hardpan, gravel or stone content, and slope. A small amount of wildlife is in these areas. The areas are used for some recreational activities and have esthetic value.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting,

and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have a profile that is almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. The Overton series, for example, was named for the town of Overton in Clark County, Nevada.

Soils of one series can differ in texture of the surface layer or in the underlying layers and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Tobler silt loam, wet, is one of several phases within the Tobler series.

Some map units are made up of two or more dominant kinds of soil. Such map units in the survey area are called soil complexes and soil associations.

A *soil complex* consists of areas of two or more soils that are so intricately intermingled or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Garr-Rock outcrop complex, 15 to 50 percent slopes, is an example.

A *soil association* is made up of soils that are geographically associated and are shown as one unit on the map because it identifies a landscape unit. The component soils are individually large enough to be delineated separately at the scale of mapping. A soil association has considerable regularity in geographic pattern and in the kinds of soil that are a part of it. The extent of the soils can differ appreciably from one delineation to another; nevertheless, interpretations can be made for use and management of the soils. Bitter Spring-Arizo association is an example.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Rock outcrop is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

The soils in the Virgin River Area were mapped at either low intensity or high intensity. Low-intensity map units were examined at moderate to wide intervals. A wide range of slope was permitted if it did not significantly affect use and management. High-intensity units were examined at closer intervals and were mapped in more detail and at a larger scale. Low-intensity units can be identified because the second letter of the map symbol is capitalized; the second letter of high-intensity units is not capitalized.

The acreage and proportionate extent of each map unit are given in table 4, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

Soil descriptions

Ad—Alluvial land. Alluvial land is along the major streams and in tributary drainageways. It consists of highly stratified, very deep, recent sands, silts, and clays that have been deposited in layers 1 inch to 3 inches thick. Alluvial land is poorly drained and has a water table that fluctuates between the surface and a depth of 24 inches. It is strongly salt affected as a result of surface evaporation and the poor quality of the ground water.

Generally, fine sands are most extensive in this unit. They are on smooth broad flood plains of the Virgin River and are subject to periodic flooding. Flooding occurs as often as 2 or 3 times annually and takes place 2 or 3 years in 5. While the sands are inundated, the surface layer may be completely removed or may receive fresh sediment, depending upon the location and position of the sands and the duration of the flooding.

Commonly along the Muddy River and the Meadow Valley Wash and their tributaries are areas that are mainly stratified silts and clays. Generally, the silts are dominant. They occur along the narrow, entrenched flood plains and are subject to flooding. The frequency of flooding differs from that of the Virgin River drain-

ageway. The flooding in this area is caused mainly by cloudbursts in the upper part of the watershed. As a result, little deposition occurs and erosion is common.

The vegetation on Alluvial land is variable, but it consists mainly of a dense stand of tamarisk that has an understory of saltgrass, greasewood, big saltbush, and arrowweed. Mesquite is present in places, as well as introduced species such as alta fescue and bermudagrass.

Alluvial land has limited value for farming if it is not protected from flooding. It is used only for very limited livestock grazing because of the density of the stand of tamarisk, which restricts the accessibility of livestock.

This unit is in capability subclass VIIw, nonirrigated.

Ae—Anthony fine sandy loam. This deep, well drained soil is on flood plains, small alluvial fans, and low stream terraces. It formed in alluvium derived dominantly from mixed rock sources. Slope is 0 to 2 percent. Elevation is 1,400 to 3,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 62 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is light brown fine sandy loam about 8 inches thick. The underlying material to a depth of 60 inches or more is light brown fine sandy loam.

Included in this unit are small areas of Gila loam, saline, and Toquop fine sand. Included areas make up less than 5 percent of the total acreage.

Permeability of this Anthony soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is rarely flooded.

Most areas of this unit are used for irrigated crops, mainly row crops such as spring onions, radishes, sugar beets, and tomato plants. Among the other crops grown are alfalfa for hay and pasture. This unit is also used for livestock grazing in winter and spring and for wildlife habitat.

The present vegetation on this unit is mainly a sparse cover of arrowweed pluchea, fourwing saltbush, big saltbush, and grasses.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by low precipitation.

This unit is well suited to irrigated crops. It has few limitations. Water for irrigation is not available in all areas of this unit.

This unit is poorly suited to homesite development. The main limitation is the hazard of flooding. Protection from flooding can be provided by the use of dikes or channels to divert the water.

If this unit is used for recreational development, the main limitation is the hazard of flooding. Protection from flooding can be provided by the construction of extensive dikes.

This unit is in capability class I, irrigated, and capability subclass VIIc, nonirrigated.

Af—Anthony fine sandy loam, gravelly substratum. This deep, well drained soil is on flood plains and low terraces. It formed in alluvium derived dominantly from mixed rock sources. Slope is 0 to 2 percent. Elevation is 1,400 to 3,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 62 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is brown fine sandy loam about 8 inches thick. The upper 22 inches of the underlying material is pale brown fine sandy loam. The lower part to a depth of 60 inches or more is brown very gravelly sandy loam.

Included in this unit are small areas of Toquop fine sand and a soil that is similar to this Anthony soil but that does not have a gravelly substratum. Included areas make up less than 5 percent of the total acreage.

Permeability of this Anthony soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is high if the plant cover is removed and the soil is left exposed. This soil is subject to occasional, very brief periods of flooding.

This unit is used for livestock grazing and wildlife habitat. It can be used as irrigated cropland if water for irrigation is made available.

The present vegetation on this unit is mainly a sparse cover of white bursage, creosotebush, big galleta, and Indian ricegrass.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by low precipitation.

This unit is poorly suited to homesite development. The main limitations are the hazards of flooding and seepage. Protection from flooding can be provided by the use of dikes or channels to divert the water. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems.

If this unit is used for recreational development, the main limitation is hazard of flooding. Protection from flooding can be provided by the construction of extensive dikes.

This unit is in capability subclasses IIIw, irrigated, and VIIw, nonirrigated.

Ah—Anthony fine sandy loam, water table. This deep, well drained soil is on flood plains and low terraces. It formed in alluvium derived dominantly from mixed rock sources. Slope is 0 to 2 percent. Elevation is 1,400 to 3,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature

is 62 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is brown fine sandy loam about 8 inches thick. The underlying material to a depth of 60 inches or more is pale brown fine sandy loam and sandy loam.

Included in this unit are small areas of Gila loam, Overton silty clay, and Virgin River silty clay. Included areas make up less than 5 percent of the total acreage.

Permeability of this Anthony soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The water table fluctuates between depths of 4 and 6 feet. This soil is rarely flooded. Drainage of the soil has been altered by excessive irrigation of nearby soils.

This unit is used for livestock grazing and wildlife habitat. It can be used as irrigated cropland if water for irrigation is made available.

The present vegetation on this unit is mainly a moderate cover of fourwing saltbush, arrowweed pluchea, big saltbush, and alkali sacaton.

This unit is well suited to irrigated crops. It can be used for climatically adapted crops such as vegetable row crops, alfalfa for hay, small grain, and grass and legume pasture.

This unit is poorly suited to homesite development. The main limitations are the position on the landscape, the hazard of flooding, and the depth to the water table. Protection from flooding can be provided by the use of dikes or channels to divert the water. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table. Seepage from these systems can pollute water supplies and thus create a hazard to health. Deep drains can be used to lower the water table. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies.

If this unit is used for recreational development, the main limitations are the hazards of soil blowing and flooding. Areas used for recreation can be protected from soil blowing and dust by maintaining plant cover. Small dikes can be used to reduce the risk of flooding.

This unit is in capability subclasses IIw, irrigated, and VIIw, nonirrigated.

AMC—Arada fine sand, 2 to 8 percent slopes. This deep, somewhat excessively drained soil is on alluvial fans and terraces. It formed in alluvium derived dominantly from mixed rock sources. Elevation is 1,400 to 2,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 61 to 66 degrees F, and the average frost-free period is about 250 days.

Typically, the surface layer is pink fine sand about 6 inches thick. The upper 21 inches of the underlying material is pink fine sand. The next 10 inches is pink gravelly loamy fine sand. The lower part to a depth of 60 inches or more is pinkish white and very pale brown, stratified very gravelly sandy loam to very gravelly loamy coarse sand.

Included in this unit are small areas of Toquop fine sand, Tonopah gravelly fine sand, and Bard gravelly fine sand. Included areas make up less than 10 percent of the total acreage.

Permeability of this Arada soil is moderately rapid. Available water capacity is very low and low. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used for livestock grazing and wildlife habitat. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, range ratany, and grasses.

This unit is poorly suited to livestock grazing. The main limitations are low available water capacity and low precipitation.

This unit is suited to irrigated crops. If water for irrigation were available, the unit could be used for climatically adapted crops such as vegetable row crops, alfalfa for hay, small grain, and grasses and legumes for pasture.

This unit is in capability subclasses IVs, irrigated, and VIIs, nonirrigated.

AOB—Arada fine sand, gravelly substratum, 0 to 4 percent slopes. This deep, somewhat excessively drained soil is on alluvial fans and terraces. It formed in alluvium derived dominantly from mixed rock sources. Elevation is 1,400 to 2,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 61 to 66 degrees F, and the average frost-free period is about 250 days.

Typically, the surface layer is pink fine sand about 6 inches thick. The upper 18 inches of the underlying material is pink fine sand. The lower part to a depth of 60 inches or more is very pale brown, stratified very gravelly fine sandy loam to very gravelly loamy coarse sand.

Included in this unit are small areas of Arada soils that have a hardpan at a depth of more than 40 inches, Toquop fine sand, and Tonopah gravelly sandy loam. Included areas make up less than 10 percent of the total acreage.

Permeability of this Arada soil is moderately rapid. Available water capacity is very low and low. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is high.

This unit is used for limited livestock grazing and for wildlife habitat. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, range ratany, and grasses.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by low and very low available water capacity and low precipitation.

This unit is suited to irrigated crops. If water for irrigation is made available, the unit can be used for climatically adapted crops such as vegetable row crops, alfalfa for hay, small grain, and grass and legume pasture.

This unit is in capability subclasses IVs, irrigated, and VIIs, nonirrigated.

ASC—Arada fine sand, hardpan variant, 2 to 8 percent slopes. This moderately deep, somewhat excessively drained soil is on terraces. It formed in alluvium derived dominantly from mixed rock sources. Elevation is 1,400 to 2,500 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 61 to 66 degrees F, and the average frost-free period is about 250 days.

Typically, the surface layer is pink fine sand about 6 inches thick. The underlying material to a depth of 30 inches is pink fine sand. An indurated, lime-cemented hardpan is at a depth of 30 inches. Depth to the hardpan ranges from 21 to 36 inches.

Included in this unit are small areas of Arada fine sand, Gila fine sand, and Toquop fine sand. Included areas make up less than 10 percent of the total acreage.

Permeability of this Arada soil is very rapid above the hardpan and very slow through the hardpan. Available water capacity is very low. Effective rooting depth is about 30 inches. Runoff is very slow, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used for limited livestock grazing and for wildlife habitat. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a sparse cover of creosotebush, white bursage, and grasses.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by very low available water capacity and low precipitation.

This unit is suited to irrigated crops. It is suited only to those climatically adapted crops that have a shallow or moderately deep rooting depth.

This unit is in capability subclasses IVs, irrigated, and VIIs, nonirrigated.

ATA—Arizo fine sand, 0 to 2 percent slopes. This deep, excessively drained soil is on alluvial fans, on flood plains, on the floor of arroyos, and in dry washes. It formed in mixed very gravelly and sandy alluvium. Elevation is 1,200 to 4,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 61 to 66 degrees F, and the average frost-free period is about 250 days.

Typically, the surface layer is light brownish gray fine sand about 8 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray, stratified very gravelly sand and very cobbly coarse sand.

Included in this unit are small areas of Mormon Mesa loamy fine sand and Arada fine sand. Included areas make up less than 5 percent of the total acreage.

Permeability of this Arizo soil is very rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to common, very brief periods of flooding.

This unit is used for livestock grazing and wildlife habitat. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, big galleta, and annuals.

This unit is poorly suited to livestock grazing. It is limited mainly by very low available water capacity and low precipitation.

This unit is very poorly suited to irrigated crops. It is limited mainly by lack of readily available water for irrigation, droughtiness, and hazard of flooding.

This unit is poorly suited to homesite development. The main limitations are the hazards of flooding and seepage. Protection from flooding can be provided by the construction of dikes or channels to divert the water. Seepage from onsite sewage disposal systems can pollute water supplies and thus create a hazard to health.

If this unit is used for recreational development, the main limitations are the hazard of soil blowing and dustiness. Areas used for recreation can be protected from soil blowing and dust by maintaining plant cover.

This unit is in capability subclass VIIw, nonirrigated.

AVB—Arizo gravelly fine sand, 2 to 4 percent slopes. This deep, excessively drained soil is on alluvial fans. It formed in mixed, very gravelly and sandy alluvium. Elevation is 1,400 to 4,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 61 to 66 degrees F, and the average frost-free period is about 250 days.

Typically, the surface layer is light brownish gray gravelly fine sand about 8 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray, stratified very gravelly sand and very cobbly coarse sand.

Included in this unit are small areas of Mormon Mesa loamy fine sand and Arada fine sand. Included areas make up less than 5 percent of the total acreage.

Permeability of this Arizo soil is very rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of

water erosion is slight. This soil is subject to common, very brief periods of flooding.

This unit is used for limited livestock grazing and for wildlife habitat. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, desertwillow, and grasses.

This unit is poorly suited to livestock grazing. It is limited mainly by very low available water capacity and low precipitation.

This unit is very poorly suited to crops. It is limited mainly by lack of readily available water for irrigation, droughtiness, slope, and hazard of flooding.

This unit is suited to homesite development. The main limitations are the hazards of flooding and seepage. Protection from flooding can be provided by the construction of dikes or channels to divert the water. Seepage from onsite sewage disposal systems can pollute water supplies and thus create a hazard to health.

If this unit is used for recreational development, the main limitations are the hazards of flooding and soil blowing. Areas used for recreation can be protected from soil blowing and dust by maintaining plant cover.

This unit is in capability subclass VIIw, nonirrigated.

AXC—Arizo very gravelly loamy sand, 2 to 8 percent slopes. This deep, excessively drained soil is on alluvial fans. It formed in mixed very gravelly and sandy alluvium. Elevation is 1,400 to 4,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 61 to 66 degrees F, and the average frost-free period is about 250 days.

Typically, the surface layer is light brownish gray very gravelly loamy sand about 8 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray, stratified very gravelly sand and very cobbly coarse sand.

Included in this unit are small areas of Arada fine sand, Bard gravelly fine sandy loam, and Mormon Mesa fine sandy loam. Included areas make up less than 5 percent of the total acreage.

Permeability of this Arizo soil is very rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to common, very brief periods of flooding.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, desertwillow, and grasses.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by very low available water capacity and low precipitation.

This unit is in capability subclass VIIw, nonirrigated.

AYD—Arrolime gravelly silt loam, 2 to 15 percent slopes. This deep, well drained soil is on dissected alluvial fans. It formed in highly gypsiferous alluvium derived dominantly from mixed rock sources. Elevation is 1,400 to 2,600 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 60 to 65 degrees F, and the average frost-free period is about 250 days.

Typically, the surface layer is pink gravelly silt loam about 5 inches thick. The upper 44 inches of the underlying material is pink very gravelly silt loam. The lower part to a depth of 60 inches or more is light reddish brown silty clay loam.

Included in this unit are small areas of St. Thomas cobbly loam and Rock land. Included areas make up less than 5 percent of the total acreage.

Permeability of this Arrolime soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is rarely flooded.

This unit is used for limited livestock grazing and for wildlife habitat. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, Freemont dalea, desertholly, and grasses.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by low precipitation.

This unit is poorly suited to crops. It is limited mainly by lack of readily available water for irrigation and uneven topography.

This unit is in capability subclass VIIs, nonirrigated.

BD—Badland. This unit consists of severely eroded and gullied land. It is mainly on old terrace escarpments and along the walls of the canyons of the Virgin River. It is made of exposures of the Muddy Creek Formation. The Formation consists of highly stratified sand, silt, and clay that contain a large amount of gypsum and calcium carbonate.

Slope commonly is 15 to 50 percent, but it is as much as 100 percent in some areas. Runoff is very rapid, and the hazard of erosion is very high.

Areas of this unit are of limited value for farming. They generally are barren and are so eroded that they are no longer suitable for grazing. This unit provides very little habitat that is suitable for wildlife.

This unit is in capability subclass VIIIe, nonirrigated.

BFD—Bard gravelly fine sand, 4 to 15 percent slopes. This shallow, well drained soil is on alluvial fans and terraces. It formed in alluvium derived dominantly from mixed sources. Elevation is 1,800 to 2,800 feet. The average annual precipitation is about 4 to 6 inches,

the average annual air temperature is 57 to 64 degrees F, and the average frost-free period is about 250 days.

Typically, the surface layer is pink gravelly fine sand about 5 inches thick. The underlying material to a depth of 19 inches is pink fine sandy loam. An indurated, lime-cemented hardpan is at a depth of 19 inches. Depth to the hardpan ranges from 14 to 20 inches.

Included in this unit are small areas of Mormon Mesa fine sandy loam, Tonopah very gravelly sandy loam, and Glendale fine sand. Included areas make up less than 10 percent of the total acreage.

Permeability of this Bard soil is moderately rapid above the hardpan and very slow through the hardpan. Available water capacity is very low. Effective rooting depth is about 19 inches. Runoff is slow, and the hazard of water erosion is moderate.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, big galleta, and Indian ricegrass.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by very low available water capacity, shallow depth to a hardpan, and low precipitation.

This unit is in capability subclass VIIs, nonirrigated.

BHC—Bard gravelly fine sandy loam, 2 to 8 percent slopes. This shallow, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from mixed rock sources. Elevation is 1,800 to 2,800 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 64 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is pink gravelly fine sandy loam about 5 inches thick. The underlying material to a depth of 19 inches is pink fine sandy loam. An indurated, lime-cemented hardpan is at a depth of 19 inches. Depth to the hardpan ranges from 14 to 20 inches.

Included in this unit are small areas of Mormon Mesa fine sandy loam, Tonopah very gravelly sandy loam, and Glendale fine sand. Included areas make up about 10 percent of the total acreage.

Permeability of this Bard soil is moderately rapid above the hardpan and very slow through the hardpan. Available water capacity is very low. Effective rooting depth is about 19 inches. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, big galleta, and Indian ricegrass.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by low precipitation, very low available water capacity, shallow depth to a hardpan, and low precipitation.

This unit is in capability subclass VIIs, nonirrigated.

BMD—Bard very gravelly fine sandy loam, 2 to 15 percent slopes. This shallow, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from mixed rock sources. Elevation is 1,800 to 2,800 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 64 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is pink very gravelly fine sandy loam about 5 inches thick. The underlying material to a depth of 19 inches is pink fine sandy loam. An indurated, lime-cemented hardpan is at a depth of 19 inches. Depth to the hardpan ranges from 14 to 20 inches.

Included in this unit are small areas of Arada fine sand and Gila loam, saline. Included areas make up less than 10 percent of the total acreage.

Permeability of this Bard soil is moderately rapid above the hardpan and very slow through the hardpan. Available water capacity is very low. Effective rooting depth is about 19 inches. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, big galleta, and Indian ricegrass.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by gravelly texture, very low available water capacity, shallow depth to a hardpan, and low precipitation.

This unit is in capability subclass VIIs, nonirrigated.

BNB—Bard very stony loam, 2 to 4 percent slopes. This shallow, well drained soil is on old terraces and alluvial fans. It formed in alluvium derived dominantly from mixed rock sources. Elevation is 1,800 to 2,800 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 64 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is pink very stony loam about 4 inches thick. The underlying material to a depth of 15 inches is pink fine sandy loam. An indurated, lime-cemented hardpan is at a depth of 15 inches. Depth to the hardpan ranges from 14 to 20 inches.

Included in this unit are small areas of Tonopah very gravelly sandy loam, St. Thomas cobbly loam, and Rock land. Included areas make up about 10 percent of the total acreage.

Permeability of this Bard soil is moderately rapid above the hardpan and very slow through the hardpan. Available water capacity is very low. Effective rooting depth is about 15 inches. Runoff is medium, and the hazard of water erosion is slight.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, big galleta, and Indian ricegrass.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by very low available water capacity, shallow depth to a hardpan, and low precipitation.

This unit is in capability subclass VIIs, nonirrigated.

BOB—Bard-Rough broken land association, gently sloping. This map unit is on alluvial fans. Elevation is 1,800 to 2,800 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 64 degrees F, and the average frost-free period is about 240 days.

This unit is about 60 percent Bard very gravelly fine sandy loam, 2 to 4 percent slopes, and 30 percent Rough broken land. The Bard soil is on alluvial fans, and Rough broken land is on escarpments.

Included in this unit are small areas of Arizo gravelly fine sand. Included areas make up about 10 percent of the total acreage.

The Bard soil is shallow and well drained. It formed in alluvium derived dominantly from mixed rock sources. Typically, the surface layer is pink very gravelly fine sandy loam about 5 inches thick. The underlying material to a depth of 19 inches is pink fine sandy loam. An indurated, lime-cemented hardpan is at a depth of 19 inches. Depth to the hardpan ranges from 14 to 20 inches.

Permeability of the Bard soil is moderately rapid above the hardpan and very slow through the hardpan. Available water capacity is very low. Effective rooting depth is about 19 inches. Runoff is slow, and the hazard of water erosion is slight.

Rough broken land consists of eroded, short, steep areas of soil material. These areas are made up of remnants of other soils that have been deeply dissected into many narrow, V-shaped draws that have sharp divides. Runoff is rapid in these areas, and geologic erosion is active.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, big galleta, and Indian ricegrass.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by very low available water capacity, shallow depth to a hardpan, and low precipitation. Erodibility is also a limitation on Rough broken land.

The Bard soil is in capability subclass VIIs, nonirrigated. Rough broken land is in capability subclass VIIIe, nonirrigated.

BRB—Bard-Tonopah association, gently sloping. This map unit is on alluvial fans and terraces. Elevation is 1,500 to 3,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 64 degrees F, and the average frost-free period is about 240 days.

This unit is 60 percent Bard very stony loam, 2 to 4 percent slopes, and 30 percent Tonopah gravelly fine sandy loam, 2 to 8 percent slopes.

Included in this unit are small areas of Arizo fine sand. Included areas make up about 10 percent of the total acreage.

The Bard soil is shallow and well drained. It formed in alluvium derived dominantly from mixed rock sources. Typically, the surface layer is pink very stony loam about 4 inches thick. The underlying material to a depth of 15 inches is pink fine sandy loam. An indurated, lime-cemented hardpan is at a depth of 15 inches. Depth to the hardpan ranges from 14 to 20 inches.

Permeability of the Bard soil is moderately rapid above the hardpan and very slow through the hardpan. Available water capacity is very low. Effective rooting depth is about 15 inches. Runoff is slow, and the hazard of water erosion is slight.

The Tonopah soil is deep and excessively drained. It formed in alluvium derived dominantly from mixed rock sources. Typically, the surface layer is light brown gravelly fine sandy loam about 6 inches thick. The underlying material to a depth of 60 inches is light brown very gravelly sand.

Permeability of the Tonopah soil is very rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is rarely flooded.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, and Indian ricegrass.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by very low available water capacity, and stony and gravelly texture, and low precipitation.

This unit is in capability subclass VIIs, nonirrigated.

BTC—Bitter Spring-Arizo association, moderately sloping. This map unit is mainly on alluvial fans. Elevation is 1,200 to 3,200 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 64 degrees F, and the average frost-free period is about 240 days.

This unit is 55 percent Bitter Spring very gravelly loam, 2 to 15 percent slopes, and 40 percent Arizo very gravelly loamy sand, 2 to 8 percent slopes. The Bitter Spring soil is on alluvial fans, and the Arizo soil is on recent fans, on floors of arroyos, and in dry washes.

Included in this unit are small areas of Nickel gravelly sandy loam and Cave very gravelly sandy loam. Included areas make up about 5 percent of the total acreage.

The Bitter Spring soil is deep and well drained. It formed in alluvium derived dominantly from mixed rock sources. Typically, the surface layer is pink very gravelly loam about 2 inches thick. The subsoil is light reddish brown, stratified sandy loam and gravelly sandy loam about 5 inches thick. The substratum to a depth of 60 inches or more is light reddish brown very gravelly sandy loam.

Permeability of the Bitter Spring soil is moderately rapid. Available water capacity is very low and low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Arizo soil is deep and excessively drained. It formed in mixed, very gravelly and sandy alluvium. Typically, the surface layer is light brownish gray very gravelly loamy sand about 8 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray, stratified very gravelly sand and very cobbly coarse sand.

Permeability of the Arizo soil is very rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to common, brief periods of flooding.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on the Bitter Spring soil is mainly a sparse stand of creosotebush, white bursage, big galleta, and Indian ricegrass. The present vegetation on the Arizo soil is mainly a sparse stand of creosotebush, white bursage, desertwillow, and grasses.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by very low available water capacity and low precipitation.

The Bitter Spring soil is in capability subclass VIIs, nonirrigated. The Arizo soil is in capability subclass VIIw, nonirrigated.

Bu—Black Butte silt loam. This deep, well drained soil is on flood plains and low terraces. It formed in mixed material derived dominantly from limestone, sandstone, and shale. Slope is 0 to 2 percent. Elevation is 1,500 to 2,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 64 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is light reddish brown silt loam about 6 inches thick. The upper 14 inches of the underlying material is light reddish brown, stratified fine sandy loam to silty clay loam. The lower part to a depth of 60 inches or more is light reddish brown fine sand.

Included in this unit are small areas of Virgin River silty clay loam. Also included are areas of salt-affected soils. Included areas make up less than 5 percent of the total acreage.

Permeability of this Black Butte soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is rarely flooded.

Most areas of this unit are used for irrigated crops, mainly sugar beets, corn, small grain, alfalfa for hay, and grass and legume pasture.

This unit is well suited to irrigated crops. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

Where this unit is used for alfalfa for hay, it provides aftermath grazing. The productivity of the unit can be maintained by proper grazing use and pasture management.

Windbreaks are suitable for use on this unit. They protect the farmstead, reduce damage to seedlings, have esthetic value, and provide habitat for some species of wildlife.

This unit is suited to homesite development. The main limitations are the hazards of flooding and seepage. Protection from flooding can be provided by the construction of dikes or channels to divert the water. Seepage from onsite sewage disposal systems can pollute water supplies and thus create a hazard to health.

If this unit is used for recreational development, the main limitations are the hazard of flooding and dustiness. Protection from flooding can be provided by the construction of extensive dikes. Areas used for recreation can be protected from dust by maintaining plant cover.

This unit is in capability subclass IIIs.

Bv—Black Butte silt loam, water table. This deep, wet soil is on flood plains. It formed in mixed material derived dominantly from limestone, sandstone, and shale. Slope is 0 to 2 percent. Elevation is 1,500 to 2,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 64 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is light reddish brown silt loam about 6 inches thick. The upper 14 inches of the underlying material is light reddish brown, stratified fine sandy loam to silty clay loam. The lower part to a depth of 60 inches or more is light reddish brown fine sand.

Included in this unit are small areas of Virgin River silty clay loam. Also included are areas of nonsaline soils. Included areas make up less than 5 percent of the total acreage.

Permeability of this Black Butte soil is moderately slow. Available water capacity is moderate. Effective

rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table is at a depth of 4 to 6 feet. This soil is rarely flooded. It is slightly salt affected.

Most areas of this unit are used for irrigated crops, mainly corn, sugar beets, small grain, alfalfa for hay, and grass and legume pasture.

This unit is well suited to irrigated crops. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

Where this unit is used for alfalfa for hay, it provides aftermath grazing. The productivity of the unit can be maintained by proper grazing use and pasture management.

Windbreaks are suitable for use on this unit. They protect the farmstead, reduce damage to seedlings, have esthetic value, and provide habitat for some species of wildlife.

This unit is poorly suited to homesite development. The main limitations are the hazards of flooding and seepage and the depth to the water table. Protection from flooding can be provided by the use of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table. Seepage from these systems can pollute water supplies and thus create a hazard to health.

If this unit is used for recreational development, the main limitations are the hazard of flooding and dustiness. Protection from flooding can be provided by use of extensive dikes. Areas used for recreation can be protected from dust by maintaining plant cover.

This unit is in capability subclass IIIw, irrigated.

Bw—Bluepoint loamy fine sand. This deep, somewhat excessively drained soil is on alluvial fans and low stream terraces. It formed in sandy alluvium derived from mixed sources. Slope is 0 to 2 percent. Elevation is 1,400 to 2,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 54 to 64 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is light reddish brown loamy fine sand about 9 inches thick. The upper 32 inches of the underlying material is light reddish brown and pink, stratified loamy fine sand and fine sand. The lower part to a depth of 60 inches is pink, stratified loamy fine sand to very fine sandy loam.

Included in this unit are small areas of Tobler fine sandy loam. Also included are small areas of a Bluepoint loamy fine sand that is slightly wet. Included areas make up less than 5 percent of the total acreage.

Permeability of this Bluepoint soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is rarely flooded.

Most areas of this unit are used for irrigated crops, mainly row crops, small grain, and alfalfa for hay.

This unit is well suited to irrigated crops. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

Where this unit is used for alfalfa for hay, it provides aftermath grazing. The productivity of this unit can be maintained by proper grazing use and pasture management.

Windbreaks are suitable for use on this unit. They protect the farmstead, reduce damage to seedlings, have esthetic value, and provide habitat for some species of wildlife.

This unit is poorly suited to homesite development. The main limitations are the hazards of flooding and seepage. Protection from flooding can be provided by the construction of extensive dikes. Seepage from onsite sewage disposal systems can pollute water supplies and thus create a hazard to health. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

If this unit is used for recreational development, the main limitations are the hazard of flooding and soil blowing. Protection from flooding can be provided by the construction of extensive dikes. Areas used for recreation can be protected from soil blowing and dust by maintaining plant cover.

This unit is in capability subclass IIs, irrigated.

By—Bluepoint fine sandy loam, strongly saline. This deep, wet soil is on flood plains. It formed in sandy alluvium derived from mixed sources. Slope is 0 to 2 percent. Elevation is 1,400 to 2,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 54 to 64 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is light reddish brown fine sandy loam about 9 inches thick. The upper 32 inches of the underlying material is light reddish brown and pink, stratified loamy fine and fine sand. The lower part to a depth of 60 inches or more is pink, stratified fine sand to very fine sandy loam.

Included in this unit are small areas of Tobler fine sandy loam. Included areas make up less than 5 percent of the total acreage.

Permeability of this Bluepoint soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table is at a

depth of 4 to 5 feet. This soil is rarely flooded. It is strongly salt affected.

This unit is used for pasture. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a sparse stand of arrowweed pluchea, mesquite, and saltgrass.

This unit is suited to livestock grazing. It provides a moderate amount of forage.

This unit is suited to irrigated crops. It can be used for climatically adapted crops if it is leveled and leached of soluble salts.

This unit is suited to homesite development. The main limitations are the hazards of flooding and seepage and the depth to the water table. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table. Seepage from these systems can pollute water supplies and thus create a hazard to health.

If this unit is used for recreational development, the main limitations are the hazard of flooding and dustiness when the soil is dry. Protection from flooding can be provided by the use of dikes or channels to divert the water. Areas used for recreation can be protected from dust by maintaining plant cover.

This unit is in capability subclass VIIw, nonirrigated.

Ca—Calico fine sandy loam. This deep, somewhat poorly drained soil is on flood plains. It formed in loamy alluvium derived dominantly from mixed sources. Slope is 0 to 2 percent. Elevation is 1,200 to 1,600 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 64 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is very pale brown fine sandy loam about 6 inches thick. The upper 37 inches of the underlying material is stratified, very pale brown, light brownish gray, grayish brown, and light gray silty clay to fine sandy loam. The lower part to a depth of 60 inches or more is very pale brown fine sand.

Included in this unit are small areas of Toquop soils. Also included are small areas of other Calico soils. Included areas make up less than 5 percent of the total acreage.

Permeability of this Calico soil is slow. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table is at a depth of 3 to 4 feet. This soil is subject to occasional, very brief periods of flooding. It is slightly salt affected.

This unit is used for irrigated crops, mainly row crops, sugar beets, small grain, alfalfa for hay, and mixed grass and legume pasture.

Calico fine sandy loam is well suited to irrigated crops. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

Where this unit is used for alfalfa for hay, it provides aftermath grazing. The productivity of this unit can be maintained by proper grazing use and pasture management.

Windbreaks are suitable for use on this unit. They protect the farmstead, reduce damage to seedlings, have esthetic value, and provide habitat for some species of wildlife.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding, slow permeability, and the depth to the water table. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table and slow permeabilty.

If this unit is used for recreational development, the main limitation is the hazard of flooding. Protection from flooding can be provided by the construction of extensive dikes.

This unit is in capability subclass IIIw, irrigated.

Cc—Calico fine sandy loam, drained. This deep, somewhat poorly drained soil is on flood plains. It has been drained by the entrenchment of the stream channel and by artificial drains. It formed in loamy alluvium derived from mixed sources. Slope is 0 to 2 percent. Elevation is 1,200 to 1,600 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 64 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is very pale brown fine sandy loam about 6 inches thick. The upper 37 inches of the underlying material is stratified, very pale brown, light brownish gray, grayish brown, and light gray silty clay to fine sandy loam. The lower part to a depth of 60 inches or more is very pale brown fine sand.

Included in this unit are small areas of Gila loam and Toquop fine sandy loam. Included areas make up less than 10 percent of the total acreage.

Permeability of this Calico soil is slow. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to occasional, very brief periods of flooding.

Most areas of this unit are used for irrigated crops, mainly row crops, sugar beets, small grain, alfalfa for hay, and mixed grass and legume pasture.

This unit is well suited to irrigated crops. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

Where this unit is used for alfalfa for hay, it provides aftermath grazing. The productivity of this unit can be maintained by proper grazing use and pasture management.

Windbreaks are suitable for use on this unit. They protect the farmstead, reduce damage to seedlings, have esthetic value, and provide habitat for some species of wildlife.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding and slow permeability. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the slow permeability.

If this unit is used for recreational development, the main limitation is the hazard of flooding. Protection from flooding can be provided by construction of dikes or channels.

This unit is in capability subclass IIIw, irrigated.

Cd—Calico fine sandy loam, strongly saline. This deep, somewhat poorly drained soil is on flood plains. It formed in loamy alluvium derived from mixed sources. Slope is 0 to 2 percent. Elevation is 1,200 to 1,600 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 64 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is very pale brown fine sandy loam about 6 inches thick. The upper 37 inches of the underlying material is stratified, very pale brown, grayish brown, light brownish gray, and light gray silty clay to fine sandy loam. The lower part to a depth of 60 inches or more is very pale brown fine sand.

Included in this unit are small areas of Gila loam and Toquop fine sandy loam. Included areas make up less than 5 percent of the total acreage.

Permeability of this Calico soil is slow. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table is at a depth of 3 to 4 feet. This soil is subject to occasional, very brief periods of flooding. It is strongly salt affected.

This unit is used for livestock grazing and for wildlife habitat. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a fair stand of alkali sacaton, inland saltgrass, big galleta, fourwing saltbush, and arrowweed pluchea.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by the high content of salt.

This unit is poorly suited to crops. It is limited mainly by lack of readily available water for irrigation and high content of salt. If this unit is used for crops, it needs to be leveled, drained to lower the water table, and leached of soluble salts. A conditioning period is needed for best crop production. Green manure crops such as small grain and sweet-clover can be grown as soil conditioning crops. These crops can be grazed lightly before returning the crop residue to the soil. Fair production can be expected after the conditioning period if proper management is used. Other management practices that are suited to this unit are using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, and using conservation cropping systems.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding, slow permeability, and the depth to the water table. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table and slow permeability. Deep drains can be used to lower the water table.

If this unit is used for recreational development, the main limitation is the hazard of flooding. Protection from flooding can be provided by construction of dikes or channels.

This unit is in capability subclasses IIIw, irrigated, and VIIw, nonirrigated.

Cm—Calico clay loam. This deep, somewhat poorly drained soil is on flood plains. It formed in loamy alluvium derived from mixed sources. Slope is 0 to 2 percent. Elevation is 1,200 to 1,600 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 64 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is very pale brown clay loam about 6 inches thick. The upper 37 inches of the underlying material is stratified very pale brown, grayish brown, light brownish gray, and light gray silty clay to fine sandy loam. The lower part to a depth of 60 inches or more is very pale brown fine sand.

Included in this unit are small areas of other Calico soils. Also included are small areas of Gila loam and Toquop fine sandy loam. Included areas make up less than 10 percent of the total acreage.

Permeability of this Calico soil is slow. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table is at a depth of 3 to 4 feet. This soil is subject to occasional, very brief periods of flooding. It is slightly salt affected.

This unit is used for irrigated salt-tolerant crops, sugar beets, small grain, alfalfa for hay, and mixed grass and legume pasture.

This unit is suited to irrigated crops. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, reducing the content of toxic salts,

using conservation cropping systems, and returning crop residue to the soil.

Where this unit is used for alfalfa for hay, it provides aftermath grazing. The productivity of this unit can be maintained by proper grazing use and pasture management.

Windbreaks are suitable for use on this unit. They protect the farmstead, reduce damage to seedlings, have esthetic value, and provide habitat for some species of wildlife.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding, slow permeability, and the depth to the water table. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table and slow permeability. Deep drains can be used to lower the water table.

If this unit is used for recreational development, the main limitation is the hazard of flooding. Protection from flooding can be provided by the construction of dikes or channels.

This unit is in capability subclass IIIw, irrigated.

Cn—Calico loamy fine sand, coarse variant, drained. This deep, somewhat poorly drained soil is on flood plains. It has been drained by the entrenchment of the stream channel and by artificial drains. It formed in loamy alluvium derived dominantly from limestone with a mixture of sandstone and other rock. Slope is 0 to 2 percent. Elevation is 1,200 to 1,600 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 64 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is very pale brown loamy fine sand about 9 inches thick. The upper 8 inches of the underlying material is stratified, very pale brown loamy fine sand to fine sandy loam, and the lower part to a depth of 60 inches or more is stratified, light brownish gray silty clay to silty clay loam.

Included in this unit are small areas of other Calico soils. Also included are small areas of Anthony fine sandy loam and a Gila loam that is strongly saline. Included areas make up less than 5 percent of the total acreage.

Permeability of this Calico soil is slow. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to occasional, very brief periods of flooding.

This unit is used for livestock grazing and for wildlife habitat. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a fair stand of alkali sacaton, inland saltgrass, big saltbush, fourwing saltbush, mesquite, and arrowweed pluchea.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by low precipitation.

This unit is poorly suited to crops. It is limited mainly by lack of readily available water for irrigation. If this unit is irrigated, it can be used for such crops as alfalfa, small grain, row crops, and mixed grass and legume pasture. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

This map unit is poorly suited to homesite development. The main limitations are the hazard of flooding and slow permeability. Protection from flooding can be provided only by the use of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the slow permeability.

If this unit is used for recreational development, the main limitations are the hazard of flooding and dustiness. Protection from flooding can be provided by use of extensive dikes. Areas used for recreation can be protected from dust by maintaining plant cover.

This unit is in capability subclasses IIIw, irrigated, and VIIw, nonirrigated.

Co—Calico loamy fine sand, coarse variant, strongly saline. This deep, somewhat poorly drained soil is on flood plains. It formed in loamy alluvium derived dominantly from limestone and a mixture of sandstone, basalt, and other rock. Slope is 0 to 2 percent. Elevation is 1,200 to 1,600 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 64 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is very pale brown loamy fine sand about 9 inches thick. The upper 18 inches of the underlying material is very pale brown, stratified loamy fine sand to fine sandy loam, and the lower part to a depth of 60 inches or more is light brownish gray, stratified silty clay to silty clay loam.

Included in this unit are small areas of Overton silt loam, saline. Included areas make up less than 5 percent of the total acreage.

Permeability of this Calico soil is slow. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table is at a depth of 3 to 4 feet. This soil is strongly salt affected.

This unit is used for livestock grazing and for wildlife habitat. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a fair stand of alkali sacaton, inland saltgrass, arrowweed pluchea, and mesquite.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by the high content of salts.

This unit is poorly suited to crops. It is limited mainly by lack of readily available water for irrigation and high content of salts. If this unit is used for crops, it needs to be leveled and leached of soluble salts.

This map unit is poorly suited to homesite development. The main limitations are the hazard of flooding, slow permeability, and the depth to the water table. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table and slow permeability. Deep drains can be used to lower the water table.

If this unit is used for recreational development, the main limitations are the hazard of flooding and dustiness. Protection from flooding can be provided by the construction of extensive dikes. Areas used for recreation can be protected from soil blowing and dust by maintaining plant cover.

This unit is in capability subclasses IIIw, irrigated, and VIIw, nonirrigated.

CTC—Colorock-Tonopah association, moderately sloping. This map unit is on alluvial fans and terraces. Elevation is 1,300 to 3,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 64 degrees F, and the average frost-free period is about 240 days.

This unit is about 55 percent Colorock very gravelly loam, 2 to 8 percent slopes, and 40 percent Tonopah very gravelly sandy loam, 2 to 8 percent slopes. The Colorock soil is on alluvial fans, and the Tonopah soil is on alluvial fans and terraces.

Included in this unit are small areas of Arizo fine sand. Included areas make up about 5 percent of the total acreage.

The Colorock soil is shallow and well drained. It formed in gravelly alluvium derived dominantly from mixed rock sources. Typically, the surface layer is pink very gravelly loam about 3 inches thick. The subsoil is pink very gravelly sandy loam about 12 inches thick over an indurated, lime-cemented hardpan about 22 inches thick. Underlying the pan to a depth of 60 inches is light gray very gravelly sandy loam. Depth to the hardpan ranges from 12 to 20 inches.

Permeability of the Colorock soil is moderately rapid above the hardpan and very slow through the hardpan. Available water capacity is very low. Effective rooting depth is about 15 inches. Runoff is medium, and the hazard of water erosion is slight. This soil is rarely flooded.

The Tonopah soil is deep and excessively drained. It formed in alluvium derived dominantly from mixed rock sources. Typically, the surface layer is light gray very gravelly sandy loam about 6 inches thick. The underlying material to a depth of 60 inches or more is light brown very gravelly sand.

Permeability of the Tonopah soil is very rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is rarely flooded.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, big galleta, and Indian ricegrass.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by very low available water capacity, gravelly texture, the depth to the hardpan in the Colorock soil, and low precipitation.

This unit is in capability subclass VIIs, nonirrigated.

CYB—Crystal Springs gravelly sandy loam, 2 to 4 percent slopes. This shallow, well drained soil is on alluvial fans and terraces. It formed in gravelly alluvium derived from mixed rock sources. Elevation is 3,000 to 4,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 64 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is pale brown gravelly sandy loam about 1 inch thick. The underlying material to a depth of 11 inches is pale brown gravelly fine sandy loam. The next layer is an indurated, lime-cemented hardpan. Depth to the hardpan ranges from 11 to 20 inches.

Included in this unit are small areas of Flattop gravelly clay loam and Tonopah very gravelly sandy loam. Included areas make up less than 10 percent of the total acreage.

Permeability of the Crystal Springs soil is moderately rapid above the hardpan and very slow through the hardpan. Available water capacity is very low. Effective rooting depth is about 11 inches. Runoff is medium, and the hazard of water erosion is slight. This soil is rarely flooded.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, blackbrush, and Mohave yucca.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by shallow depth to the hardpan, very low available water capacity, and low precipitation.

This unit is in capability subclass VIIs, nonirrigated.

Ea—Eastland gravelly sandy loam. This deep, well drained soil is on alluvial fans and terraces. It formed in mixed alluvium derived dominantly from mixed rock sources. Slope is 0 to 4 percent. Elevation is 1,800 to

2,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is light brown gravelly sandy loam about 17 inches thick. The upper 21 inches of the underlying material is light brown very gravelly sand. The lower part to a depth of 60 inches or more is pink, stratified gravelly loamy sand to sandy loam.

Included in this unit are small areas of Vinton fine sandy loam and Tonopah very gravelly sandy loam. Included areas make up less than 10 percent of the total acreage.

Permeability of this Eastland soil is moderately rapid. Available water capacity is low or very low. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is rarely flooded.

This unit is used for irrigated crops, mainly alfalfa, small grain, and grass and legume pasture.

This unit is suited to irrigated crops. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent overirrigation, using conservation cropping systems, and returning crop residue to the soil.

Where this unit is used for alfalfa for hay, it provides aftermath grazing. The productivity of this unit can be maintained by proper grazing use and pasture management.

Windbreaks are suitable for use on this unit. They protect the farmstead, reduce damage to seedlings, have esthetic value, and provide habitat for some species of wildlife.

This unit is poorly suited to homesite development. The main limitations are the hazards of flooding and seepage. Protection from flooding can be provided by the construction of extensive dikes. Seepage from onsite sewage disposal systems can pollute water supplies and thus create a hazard to health. This unit is a good source of roadfill.

This unit is in capability subclass IVs, irrigated.

FLC—Flattop gravelly clay loam, 2 to 8 percent slopes. This moderately deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from mixed rock sources. Elevation is 1,600 to 2,600 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 65 to 68 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is reddish brown gravelly clay loam about 5 inches thick. The subsoil is yellowish red very gravelly fine sandy loam about 17 inches thick. The upper part of the substratum is light brown very gravelly loamy fine sand about 8 inches thick. The lower part to a depth of 60 inches or more is weakly cemented very gravelly sand. Cementation increases below a depth of about 40 inches.

Included in this unit are small areas of Mormon Mesa fine sandy loam, Tonopah gravelly sandy loam, and Badland. Included areas make up about 15 percent of the total acreage.

Permeability of this Flattop soil is moderately rapid. Available water capacity is very low. Effective rooting depth is about 40 inches. Runoff is medium, and the hazard of water erosion is moderate. This soil is rarely flooded.

This unit is used for livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of creosotebush, big galleta, and Indian ricegrass.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by lack of readily available water for irrigation, very low available water capacity, and low precipitation.

This unit is in capability subclass VIIs, nonirrigated.

GAE—Garr-Rock outcrop complex, 15 to 50 percent slopes. This map unit is on foothills and mountainsides. Elevation is 2,000 to 3,500 feet. The average annual precipitation is about 4 to 8 inches, the average annual air temperature is 61 to 65 degrees F, and the average frost-free period is about 230 days.

This unit is 50 percent Garr very cobbly sandy loam and 35 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Nickel gravelly sandy loam and Arizo very gravelly loamy sand. Included areas make up about 15 percent of the total acreage.

The Garr soil is shallow and well drained. It formed in residuum derived dominantly from metamorphic rock. Typically, the surface layer is light brown very cobbly sandy loam about 2 inches thick. The subsoil is light brown very gravelly fine sandy loam about 14 inches thick. Unweathered bedrock is at a depth of 16 inches. Depth to bedrock ranges from 12 to 20 inches.

Permeability of the Garr soil is moderately rapid. Available water capacity is very low. Effective rooting depth is about 16 inches. Runoff is medium, and the hazard of water erosion is moderate.

Rock outcrop consists of areas of exposed gneiss on ridges. It is intermingled with areas of the Garr soil.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, pricklypear, Mohave yucca, and grasses.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by shallow depth to rock, very low available water capacity, steepness of slope, and low precipitation.

This unit is in capability subclass VIIs, nonirrigated.

Gd—Gila fine sand. This deep, well drained soil is on flood plains and low terraces. It formed in alluvium derived dominantly from mixed sources. Slope is 0 to 2 percent. Elevation is 1,500 to 1,800 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 63 to 68 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is grayish brown fine sand about 9 inches thick. The underlying material to a depth of 60 inches or more is brown, stratified silt loam to fine sandy loam.

Included in this unit are small areas of Toquop fine sand, Gila loam, and a Gila soil that is strongly saline. Included areas make up less than 10 percent of the total acreage.

Permeability of this Gila soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to occasional, very brief periods of flooding.

This unit is used for livestock grazing and for wildlife habitat. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, big galleta, Indian ricegrass, and fourwing saltbush.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by low precipitation.

This unit is well suited to irrigated crops. It is limited mainly by lack of readily available water for irrigation. If irrigated, this unit can be used for row crops, alfalfa, small grain, and grass and legume pasture. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

This unit is poorly suited to homesite development. The main limitation is the hazard of flooding. Protection from flooding can be provided by the construction of extensive dikes. This unit is a fair source of roadfill.

This unit is in capability subclasses IIw, irrigated, and VIIw, nonirrigated.

Ge—Gila loam. This deep, well drained soil is on flood plains and low terraces. It formed in alluvium derived dominantly from mixed sources. Slope is 0 to 2 percent. Elevation is 1,500 to 1,800 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 63 to 68 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is pink loam about 9 inches thick. The underlying material to a depth of 60 inches or more is brown, stratified silt loam to fine sandy loam.

Included in this unit are small areas of Gila fine sand and Gila loam, strongly saline. Included areas make up less than 10 percent of the total acreage.

Permeability of this Gila soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to occasional, very brief periods of flooding.

This unit is used for irrigated crops, mainly alfalfa, small grain, and grass and legume pasture.

This unit is well suited to irrigated crops. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

Where this unit is used for alfalfa for hay, it provides aftermath grazing. The productivity of this unit can be maintained by proper grazing use and pasture management.

Windbreaks are suitable for use in irrigated areas of this unit. They protect the farmstead, reduce damage to seedlings, have esthetic value, and provide habitat for some species of wildlife.

This unit is poorly suited to homesite development. The main limitation is the hazard of flooding. This unit can be protected from flooding by the construction of extensive dikes.

This unit is in capability subclass IIw, irrigated.

Gf—Gila loam, strongly saline. This deep, well drained soil is on flood plains and low terraces. It formed in alluvium derived dominantly from mixed sources. Slope is 0 to 2 percent. Elevation is 1,500 to 1,800 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 63 to 68 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is grayish brown loam about 9 inches thick. The underlying material to a depth of 60 inches or more is brown, stratified silt loam to fine sandy loam.

Included in this unit are small areas of Toquop fine sand, Anthony fine sandy loam, and a Gila soil that is nonsaline. Included areas make up less than 10 percent of the total acreage.

Permeability of this Gila soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to occasional, very brief periods of flooding. It is strongly salt affected.

This unit is used for limited livestock grazing and for wildlife habitat. It can be used for irrigated crops if a source of water for irrigation is made available.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, big galleta, Indian ricegrass, and fourwing saltbush.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by low precipitation and excess salt.

This unit is suited to irrigated crops. It is limited mainly by lack of readily available water for irrigation. If irrigated, this unit is suited to such crops as alfalfa, small grain, and grass and legume pasture. If this unit is used for crops, it needs to be leveled and leached of soluble salts. It can produce good yields after a proper conditioning period if good management is used. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

This unit is poorly suited to homesite development. The main limitation is the hazard of flooding. This unit can be protected from flooding by the construction of extensive dikes.

This unit is in capability subclasses IVw, irrigated, and VIIw, nonirrigated.

Gm—Gila loam, water table. This deep, wet soil is on flood plains and low terraces. It formed in alluvium derived dominantly from mixed sources. Slope is 0 to 2 percent. Elevation is 1,500 to 1,800 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 63 to 68 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is grayish brown loam about 9 inches thick. The underlying material to a depth of 60 inches or more is brown, stratified silt loam to fine sandy loam.

Included in this unit are small areas of Glendale loam, strongly saline, and Virgin River silty clay. Included areas make up less than 5 percent of the total acreage.

Permeability of this Gila loam soil is moderate. Available water capacity is high. Effective rooting depth is 48 to 60 inches. Runoff is slow, and the hazard of water erosion is slight. The water table is at a depth of 4 to 5 feet in summer. This soil is subject to occasional, very brief periods of flooding.

This unit is used for irrigated crops, mainly row crops, sugar beets, alfalfa for hay, and grass and legume pasture.

This unit is well suited to irrigated crops. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent raising the level of the water table, using conservation cropping systems, and returning crop residue to the soil.

Where this unit is used for alfalfa for hay, it provides aftermath grazing. The productivity of this unit can be maintained by proper grazing use and pasture management.

Windbreaks are suitable for use on this unit. They protect the farmstead, reduce damage to seedlings, have esthetic value, and provide habitat for some species of wildlife.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding and the depth to the water table. Protection from flooding can be provided by the construction of extensive dikes. Deep drains can be used to lower the water table.

This unit is in capability subclass IIw, irrigated.

Gn—Gila loam, water table, strongly saline. This deep, wet soil is on flood plains and low terraces. It formed in alluvium derived dominantly from mixed sources. Slope is 0 to 2 percent. Elevation is 1,500 to 1,800 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 63 to 68 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is grayish brown loam about 9 inches thick. The underlying material to a depth of 60 inches or more is brown, stratified silt loam to fine sandy loam.

Included in this unit are small areas of a Gila loam that is wet, but is not strongly saline. Also included are small areas of Virgin River silty clay. Included areas make up less than 5 percent of the total acreage.

Permeability of this Gila soil is moderate. Available water capacity is high. Effective rooting depth is 48 to 60 inches. Runoff is slow, and the hazard of water erosion is slight. The water table is at a depth of 4 to 5 feet in summer. The soil is strongly salt affected.

This unit is used for livestock grazing and for wildlife habitat. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a sparse stand of alkali sacaton, inland saltgrass, fourwing saltbush, and mesquite.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by low precipitation and excess salt.

This unit is suited to irrigated crops. It is limited mainly by lack of readily available water for irrigation. If irrigated, it can be used for row crops, sugar beets, alfalfa, small grain, and mixed grass and legume pasture. If this unit is used for crops, it needs to be leveled and leached of soluble salts. This unit can produce good yields after a proper conditioning period if good management is used. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the

development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

This unit is poorly suited to homesite development. The main limitations are the hazards of flooding and seepage. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the high water table. Seepage from these systems can pollute water supplies and thus create a hazard to health.

This unit is in capability subclasses IVw, irrigated, and VIIw, nonirrigated.

Go—Glendale fine sand. This deep, well drained soil is on flood plains and low terraces. It formed in alluvium derived dominantly from mixed rock sources. Slope is 0 to 2 percent. Elevation is 1,500 to 2,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 63 to 68 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is light brownish gray fine sand about 8 inches thick. The upper 34 inches of the underlying material is the grayish brown clay loam and silty clay loam. The lower part to a depth of 60 inches or more is grayish brown very fine sandy loam.

Included in this unit are small areas of Glendale loam; Glendale loam, strongly saline; and Tonopah gravelly sandy loam. Included areas make up less than 10 percent of the total acreage.

Permeability of this Glendale soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is subject to occasional, very brief periods of flooding.

This unit is used for livestock grazing and for wildlife habitat. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, big galleta, Indian ricegrass, fourwing saltbush, and yucca.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by low precipitation.

This unit is well suited to irrigated crops. It is limited mainly by lack of readily available water for irrigation. If irrigated, this unit can be used for row crops, alfalfa, small grain, and mixed grass and legume pasture. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

This unit is poorly suited to homesite development. It is limited mainly by the hazard of flooding and moderately slow permeability. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the moderately slow permeability.

This unit is in capability subclasses IIw, irrigated, and VIIw, nonirrigated.

Gr—Glendale loam. This deep, well drained soil is on flood plains and low terraces. It formed in alluvium derived from mixed rock sources. Slope is 0 to 2 percent. Elevation is 1,500 to 2,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 63 to 68 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is light brownish gray loam about 8 inches thick. The upper 34 inches of the underlying material is grayish brown clay loam and silty clay loam. The lower part to a depth of 60 inches or more is grayish brown very fine sandy loam.

Included in this unit are small areas of Glendale loam, strongly saline, and Tonopah gravelly sandy loam. Included areas make up less than 10 percent of the total acreage.

Permeability of this Glendale soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to occasional, very brief periods of flooding.

This unit is used for livestock grazing and for wildlife habitat. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, Indian ricegrass, big galleta, fourwing saltbush, and yucca.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by low precipitation.

This unit is well suited to irrigated crops. It is limited mainly by lack of readily available water for irrigation. It can be used for row crops, alfalfa, small grain, and mixed grass and legume pasture. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding and moderately slow permeability. Protection from flooding can be provided by the use of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the moderately slow permeability.

This unit is in capability subclasses IIw, irrigated, and VIIw, nonirrigated.

Gs—Glendale loam, strongly saline. This deep, well drained soil is on flood plains and low terraces. It formed

in alluvium derived from mixed rock sources. Slope is 0 to 2 percent. Elevation is 1,500 to 2,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 63 to 68 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is light brownish gray loam about 9 inches thick. The upper 34 inches of the underlying material is grayish brown clay loam and silty clay loam. The lower part to a depth of 60 inches or more is grayish brown very fine sandy loam.

Included in this unit are small areas of Anthony fine sandy loam and Overton silt loam. Included areas make up less than 10 percent of the total acreage.

Permeability of this Glendale soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to occasional, very brief periods of flooding. It is strongly salt affected.

This unit is used for limited livestock grazing and for wildlife habitat. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, big galleta, and Indian ricegrass.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by low precipitation and excess salt.

This unit is suited to crops. It is limited mainly by lack of readily available water for irrigation. If irrigated, it can be used for sugar beets, small grain, alfalfa, and mixed grass and legume pasture. If this unit is used for crops, it needs to be leveled and leached of soluble salts. It can produce fair yields after a proper conditioning period if good management is used. Other management practices that are suited to this unit are using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding and moderately slow permeability. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the moderately slow permeability.

This unit is in capability subclass VIIw, nonirrigated.

Gv—Grapevine loam. This deep, well drained soil is on terraces. It formed in loamy alluvium derived from mixed rock sources. Slope is 0 to 4 percent. Elevation is about 2,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 60 to 62 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is reddish yellow loam about 10 inches thick. The underlying material to a depth of 60 inches or more is pink, stratified fine sandy loam to clay loam.

Included in this unit are small areas of Anthony fine sandy loam and Ireteba loam. Included areas make up less than 10 percent of the total acreage.

Permeability of this Grapevine soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is rarely flooded.

This unit is used for limited livestock grazing and for wildlife habitat. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, catclaw, big galleta, and shadscale.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by low precipitation.

This unit is suited to crops. It is limited mainly by lack of readily available water for irrigation. If irrigated, it can be used for crops such as sugar beets, small grain, alfalfa, and mixed grass and legume pasture. This unit can produce fair yields after a proper conditioning period if good management is used. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

This unit is in capability class I, irrigated, and capability subclass VIIc, nonirrigated.

Ir—Ireteba loam. This deep, well drained soil is on low fans and in basins. It formed in loamy alluvium derived dominantly from mixed rock sources. Slope is 0 to 2 percent. Elevation is 1,200 to 2,200 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 68 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is pale brown loam about 12 inches thick. The underlying material to a depth of 60 inches or more is light brown, stratified loam to loamy fine sand.

Included in this unit are small areas of Grapevine loam, Colorock very gravelly loam, and Tonopah very gravelly sandy loam. Included areas make up less than 5 percent of the total acreage.

Permeability of this Ireteba soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is rarely flooded.

This unit is used for livestock grazing and for wildlife habitat. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, big galleta, and Indian ricegrass.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by low precipitation.

This unit is suited to irrigated crops. It is limited mainly by lack of readily available water for irrigation. If irrigated, it can be used for crops such as sugar beets, small grain, alfalfa, and mixed grass and legume pasture. If this unit is used for crops, it can produce fair yields after a proper conditioning period if good management is used. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

This unit is in capability subclasses I, irrigated, and VIIc, nonirrigated.

It—Ireteba loam, overflow. This deep, well drained soil is in basins. It formed in loamy alluvium derived dominantly from mixed rock sources. Slope is 0 to 2 percent. Elevation is 1,700 to 2,200 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 68 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is pale brown loam about 12 inches thick. The underlying material to a depth of 60 inches or more is light brown, stratified fine sandy loam and loam.

Included in this unit are small areas of an Ireteba loam that is not subject to overflow. Also included are small areas of Playas. Included areas make up less than 5 percent of the total acreage.

Permeability of this Ireteba soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is frequently flooded and ponded because of its depressional position on the landscape.

This unit is used for limited livestock grazing and for wildlife habitat. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, big galleta, and Indian ricegrass.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by low precipitation.

This unit is suited to irrigated crops. It is limited by lack of readily available water for irrigation. If irrigated, it can be used for such crops as sugar beets, small grain, alfalfa, and mixed grass and legume pasture. If this unit is used for crops, dikes are needed to protect it from overflow and ponding. This unit can produce good yields after a proper conditioning period if good management is used. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

This unit is in capability subclasses IIw, irrigated, and VIIw, nonirrigated.

La—Land loamy fine sand. This deep, somewhat poorly drained soil is on flood plains and low terraces. It formed in silty alluvium derived from mixed rock sources. Slope is 0 to 2 percent. Elevation is 1,200 to 2,400 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is grayish brown loamy fine sand about 4 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray and very pale brown, stratified silty clay to silt loam.

Included in this unit are small areas of Gila loam, strongly saline, and Gila fine sand. Included areas make up less than 5 percent of the total acreage.

Permeability of this Land soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The water table is at a depth of 4 to 6 feet. This soil is rarely flooded. It is strongly salt affected.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of alkali sacaton, inland saltgrass, iodinebush, seepweed, big saltbush, fourwing saltbush, and mesquite.

This unit is poorly suited to livestock grazing. Excess salts limit the production of forage mainly to salt-tolerant species. Forage is of low quality, and most of it is not usable by livestock.

This unit is poorly suited to crops. It is limited mainly by high content of soluble salts and gypsum and depth to the water table.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding, moderately slow permeability, and depth to the water table. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the high water table and moderately slow permeability. Deep drains can be used to lower the water table. Corrosivity to uncoated steel and concrete is high because of the high content of salt and gypsum in the soil.

This unit is in capability subclasses VIw, irrigated, and VIIw, nonirrigated.

Lc—Land silty clay loam. This deep, somewhat poorly drained soil is on flood plains and low terraces. It formed in silty alluvium derived dominantly from mixed rock sources. Slope is 0 to 2 percent. Elevation is 1,200 to 2,400 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is grayish brown silty clay loam about 4 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray and very pale brown, stratified silty clay to silt loam.

Included in this unit are small areas of Gila loam, strongly saline. Also included are small areas of alluvial soils. Included areas make up less than 5 percent of the total acreage.

Permeability of this Land soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table is at a depth of 4 to 6 feet. This soil is frequently flooded. It is strongly salt affected.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of alkali sacaton, inland saltgrass, iodinebush, seepweed, big saltbush, fourwing saltbush, and mesquite.

This unit is poorly suited to livestock grazing. Excess salts limit the production of forage mainly to salt-tolerant species. Forage is of low quality, and most of it is not usable by livestock.

This unit is poorly suited to crops. It is limited mainly by lack of readily available water for irrigation, content of salts and gypsum, and depth to the water table.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding and the depth to the water table. Protection from flooding can be provided by construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the high water table and moderately slow permeability. Deep drains can be used to lower the water table. Corrosivity to uncoated steel and concrete is high because of the high content of salt in the soil.

This unit is in capability subclasses VIw, irrigated, and VIIw, nonirrigated.

Ld—Land silty clay loam, wet. This deep soil is on flood plains and low terraces. Drainage has been altered by its proximity to the Virgin River. It formed in silty alluvium derived dominantly from mixed rock sources. Slope is 0 to 2 percent. Elevation is 1,200 to 2,400 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is grayish brown silty clay loam about 4 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray and very pale brown, stratified silty clay to silt loam.

Included in this unit are small areas of Toquop fine sandy loam, Toquop fine sand, and Toquop silty clay loam, strongly saline. Included areas make up less than 10 percent of the total acreage.

Permeability of this Land soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. A seasonal high water table is at a depth of 2 to 4 feet. This soil is subject to occasional, very brief periods of flooding. It is strongly salt affected.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of alkali sacaton, inland saltgrass, big saltbush, iodinebush, and mesquite.

This unit is poorly suited to livestock grazing. Excess salts limit the production of forage mainly to salt-tolerant species. Forage is of low quality, and most of it is not usable by livestock.

This unit is very poorly suited to crops. It is limited mainly by lack of readily available water for irrigation, high content of soluble salts and gypsum, and depth to the water table.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding, moderately slow permeability, and depth to the water table. Protection from flooding can be provided by construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the high water table and moderately slow permeability. Deep drains can be used to lower the water table. Corrosivity to uncoated steel and concrete is high because of the high content of salt in the soil.

This unit is in capability subclasses VIw, irrigated, and VIIw, nonirrigated.

MMB—Mormon Mesa loamy fine sand, 0 to 4 percent slopes. This shallow, well drained soil is on terraces. It formed in valley fill derived dominantly from limestone, quartzite, and sandstone. Elevation is 1,700 to 2,100 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is light reddish brown loamy fine sand about 2 inches thick. The underlying material to a depth of 16 inches is reddish brown fine sandy loam over an indurated, lime-cemented hardpan. Depth to the hardpan ranges from 7 to 20 inches.

Included in this unit are small areas of Arada fine sand; Arada fine sand, gravelly substratum; Tonopah gravelly sandy loam; and Badland. Included areas make up about 15 percent of the total acreage.

Permeability of this Mormon Mesa soil is moderately rapid above the hardpan and very slow through the hard-

pan. Available water capacity is very low. Effective rooting depth is 16 inches. Runoff is very slow, and the hazard of water erosion is slight.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, big galleta, Indian ricegrass, and annuals.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by very low available water capacity, shallow depth to a hardpan, and low precipitation.

This unit is in capability subclass VIIs, nonirrigated.

MOB—Mormon Mesa fine sandy loam, 0 to 8 percent slopes. This shallow, well drained soil is on terraces. It formed in valley fill derived dominantly from limestone, quartzite, and sandstone. Elevation is 1,700 to 2,100 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is light reddish brown fine sandy loam about 2 inches thick. The underlying material to a depth of 16 inches is reddish brown fine sandy loam over an indurated, lime-cemented hardpan. Depth to the hardpan ranges from 7 to 20 inches.

Included in this unit are small areas of Bard gravelly fine sandy loam, Tonopah gravelly sandy loam, and Badland. Included areas make up about 15 percent of the total acreage.

Permeability of this Mormon Mesa soil is moderately rapid above the hardpan and very slow through the hardpan. Available water capacity is very low. Effective rooting depth is 16 inches. Runoff is very slow, and the hazard of water erosion is slight.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, big galleta, Indian ricegrass, and annuals.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by very low available water capacity, shallow depth to a hardpan, and low precipitation.

This unit is in capability subclass VIIs, nonirrigated.

NAC—Nickel-Arizo association, rolling. This map unit is mainly on dissected terraces and fans on the floor of arroyos and dry washes. Elevation is 2,200 to 4,000 feet. The average annual precipitation is about 4 to 8 inches, the average annual air temperature is 60 to 65 degrees F, and the average frost-free period is about 230 days.

This unit is 50 percent Nickel gravelly sandy loam, 15 to 30 percent slopes, 30 percent Arizo very gravelly loamy sand, 2 to 8 percent slopes, and 15 percent Cave gravelly loam, 2 to 15 percent slopes. The Nickel soil is on dissected terrace side slopes, the Arizo soil is on the floor of arroyos and dry washes, and the Cave soil is on terraces and fans.

Included in this unit are small areas of Grapevine loam, Grapevine gravelly clay loam, and St. Thomas stony loam. Included areas make up about 5 percent of the total acreage.

The Nickel soil is deep and well drained. It formed in alluvium derived dominantly from mixed rock sources. Typically, the surface layer is gravelly sandy loam about 7 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray very gravelly sandy loam.

Permeability of the Nickel soil is moderately slow. Available water capacity is low or very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

The Arizo soil is deep and excessively drained. It formed in mixed very gravelly and sandy alluvium. Typically, the surface layer is light brownish gray very gravelly loamy sand about 8 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray, stratified very gravelly sand and very cobbly coarse sand.

Permeability of the Arizo soil is very rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to frequent, very brief periods of flooding.

The Cave soil is shallow and well drained. It formed in gravelly mixed alluvium. The surface layer is pink gravelly loam about 4 inches thick. The underlying material to a depth of 15 inches is reddish yellow gravelly sandy loam over an indurated, lime-cemented hardpan. Depth to the hardpan ranges from 4 to 20 inches.

Permeability of the Cave soil is moderate above the hardpan and very slow through the hardpan. Available water capacity is very low. Effective rooting depth is 19 inches. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on the Nickel soil is mainly a sparse stand of creosotebush, white bursage, big galleta, Indian ricegrass, Mohave yucca, and annuals. The present vegetation on the Arizo soil is mainly a sparse stand of creosotebush, white bursage, big galleta, Indian ricegrass, white burrobush, and mesquite. The present vegetation on the Cave soil is mainly a sparse stand of creosotebush, white bursage, Mohave yucca, and common filaree.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by low and very low available water capacity, shallow depth to a hardpan, and low precipitation.

The Nickel soil is in capability subclass VIIe, nonrrigated. The Arizo soil is in capability subclass VIIw, nonirrigated. The Cave soil is in capability subclass VIIs, nonirrigated.

Oc—Overton silty clay. This deep, very poorly drained soil is on flood plains. It formed in clayey alluvium derived dominantly from sedimentary rock and lacustrine material. Slope is 0 to 2 percent. Elevation is 1,300 to 1,500 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is gray silty clay and clay about 16 inches thick. The subsoil is gray to pale yellow silty clay about 9 inches thick. The substratum to a depth of 60 inches or more is pale yellow and light reddish brown, stratified fine sandy loam to silty clay.

Included in this unit are small areas of Calico clay loam, Calico fine sandy loam, and Virgin River silty clay. Included areas make up less than 10 percent of the total acreage.

Permeability of this Overton soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slight. The water table is at a depth of 3 to 6 feet during most of the year.

Most areas of this unit are used for irrigated crops, mainly row crops, small grain, and grass and legume pasture.

This unit is well suited to irrigated crops. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent raising the water table, using conservation cropping systems, and returning crop residue to the soil.

This unit is suited to homesite development. The main limitations are the hazard of flooding, slow permeability, and the depth to the water table. Protection from flooding can be provided by construction of extensive dikes. Deep drains can be used to lower the water table. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table and slow permeability.

This unit is in capability subclass IIw, irrigated.

Oe—Overton silty clay, slightly saline. This deep, very poorly drained soil is on flood plains. It formed in clayey alluvium derived dominantly from sedimentary rock and lacustrine material. Slope is 0 to 2 percent. Elevation is 1,300 to 1,500 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is gray silty clay and clay about 16 inches thick. The subsoil is gray to pale yellow silty clay about 9 inches thick. The substratum to a depth of 60 inches or more is pale yellow and light reddish brown, stratified silty clay to fine sandy loam.

Included in this unit are small areas of Toquop fine sand, Toquop fine sandy loam, Calico fine sandy loam, and an Overton silty clay that is nonsaline. Included areas make up less than 5 percent of the total acreage.

Permeability of this Overton soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table is at a depth of 1 foot to 6 feet during most of the year. This soil is rarely flooded. It is slightly salt affected.

This unit is used for irrigated crops, mainly row crops, sugar beets, alfalfa, small grain, and mixed grass and legume pasture.

This unit is suited to irrigated crops. The main limitations are the high water table and high salt content. Drainage systems are needed to lower the water table to allow for salt removal. Other management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent raising the water table, using conservation cropping systems, and returning crop residue to the soil.

If this unit is used for alfalfa for hay, it provides aftermath grazing. The productivity of this unit can be maintained by proper grazing use and pasture management.

Windbreaks are suitable for use on this unit. They protect the farmstead, reduce damage to seedlings, have esthetic value, and provide habitat for some species of wildlife.

This unit is suited to homesite development. The main limitations are the hazard of flooding, slow permeability, and the depth to the water table. Flooding can be controlled by the construction of major flood control structures. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table and slow permeability. Deep drains can be used to lower the water table.

This unit is in capability subclass IIIw, irrigated.

On—Overton silty clay, strongly saline. This deep, very poorly drained soil is on flood plains. It formed in clayey alluvium derived dominantly from sedimentary rock and lacustrine material. Slope is 0 to 2 percent. Elevation is 1,300 to 1,500 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is gray silty clay and clay about 16 inches thick. The subsoil is gray to pale yellow silty clay about 9 inches thick. The substratum to a depth of 60 inches or more is pale yellow and light reddish brown, stratified silty clay to fine sandy loam.

Included in this unit are small areas of Calico fine sandy loam and Overton silty clay, slightly saline. Includ-

ed areas make up less than 5 percent of the total acreage.

Permeability of this Overton soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table is at a depth of 1 foot to 6 feet during most of the year. This soil is rarely flooded. It is strongly salt affected.

This unit is used for livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of alkali sacaton, inland saltgrass, big galleta, big saltbush, mesquite, fourwing saltbush, and arrowweed pluchea.

This unit is poorly suited to livestock grazing. Excess salts limit the production of forage mainly to salt-tolerant species. Forage is of low quality, and most of it is not usable by livestock.

This unit is poorly suited to crops. It is limited mainly by lack of suitable drainage, high content of soluble salts, and slow permeability. The irrigation water needed for reclamation of the soil is not readily available.

This map unit is poorly suited to homesite development. The main limitations are the hazard of flooding, slow permeability, and the depth to the water table. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table and slow permeability. Deep drains can be used to lower the water table.

This unit is in capability subclass VIIw, nonirrigated.

Or—Overton clay, overwash, saline. This deep, very poorly drained soil is on flood plains. It formed in clayey alluvium derived dominantly from sedimentary rock and lacustrine material. Slope is 0 to 2 percent. Elevation is 1,300 to 1,500 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is gray clay and silty clay about 16 inches thick. The subsoil is gray to pale yellow silty clay about 9 inches thick. The substratum to a depth of 60 inches or more is pale yellow to light reddish brown, stratified silty clay to fine sandy loam.

Included in this unit are small areas of Glendale loam, strongly saline; Calico loamy fine sand, and Virgin River silty clay. Included areas make up less than 5 percent of the total acreage.

Permeability of this Overton soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The water table is at a depth of 1 foot to 6 feet during most of the year. This soil is rarely flooded. It is strongly salt affected.

This unit is used for livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of alkali sacaton, inland saltgrass, big galleta, big saltbush, mesquite, fourwing saltbush, and arrowweed pluchea.

This unit is poorly suited to livestock grazing. Excess salts limit the production of forage mainly to salt-tolerant species. Forage is of low quality, and most of it is not usable by livestock.

This unit is poorly suited to crops. It is limited mainly by lack of suitable drainage, high content of soluble salts, and slow permeability. The irrigation water needed for reclamation of the soil is not readily available.

This map unit is poorly suited to homesite development. The main limitations are the hazard of flooding, slow permeability, and the high water table. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table and slow permeability. Deep drains can be used to lower the water table.

This unit is in capability subclass VIIw, nonirrigated.

Os—Overton silt loam, loamy variant, slightly saline. This deep, somewhat poorly drained soil is on flood plains. It formed in alluvium derived dominantly from sandstone, shale, and limestone. Slope is 0 to 2 percent. Elevation is 1,300 to 1,500 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is 240 days.

Typically, the surface layer is grayish brown silt loam about 11 inches thick. The subsoil is light gray, stratified loamy fine sand to silt loam about 20 inches thick. The substratum to a depth of 60 inches or more is light brownish gray, stratified fine sandy loam to clay loam.

Included in this unit are small areas of Overton silty clay and Virgin River silty clay loam, strongly saline. Included areas make up less than 5 percent of the total acreage.

Permeability of this Overton soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table is at a depth of 3 to 5 feet during most of the year. This soil is rarely flooded. It is slightly salt affected.

Most areas of this unit are used for irrigated crops, mainly row crops, alfalfa, small grain, and mixed legume and grass pasture.

This unit is well suited to irrigated crops. Drainage systems are needed to lower the water table and allow for salt removal. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

If this unit is used for alfalfa for hay, it provides aftermath grazing. The productivity of this unit can be maintained by proper grazing use and pasture management.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding and the depth to the water table. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table. Deep drains can be used to lower the water table.

This unit is in capability subclass IIw, irrigated.

Ot—Overton silt loam, loamy variant, strongly saline. This deep, somewhat poorly drained soil is on flood plains. It formed in alluvium derived dominantly from sandstone, shale, and limestone. Slope is 0 to 2 percent. Elevation is 1,300 to 1,500 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is grayish brown silt loam about 11 inches thick. The subsoil is light gray, stratified loamy fine sand to silt loam about 20 inches thick. The substratum to a depth of 60 inches or more is light brownish gray, stratified fine sandy loam to clay loam.

Included in this unit are small areas of Glendale loam; Virgin River silty clay, strongly saline; and Calico fine sandy loam. Included areas make up less than 5 percent of the total acreage.

Permeability of this Overton soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. A seasonal high water table is at a depth of 3 to 5 feet during most of the year. This soil is subject to occasional, very brief periods of flooding. It is strongly salt affected.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of alkali sacaton, inland saltgrass, big saltbush, arrowweed pluchea, mesquite, and fourwing saltbush.

This unit is poorly suited to livestock grazing. Excess salts limit the production of forage mainly to salt-tolerant species. Forage is of low quality, and most of it is not usable by livestock.

This unit is poorly suited to crops. It is limited mainly by high content of soluble salts and the depth to the water table. The irrigation water needed for reclamation of the soil is not readily available.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding and the depth to the water table. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table. Deep drains can be used to lower the water table.

This unit is in capability subclass VIIw, nonirrigated.

PL—Playas. This unit is in undrained basins of intermittent lakes that do not have external drainage. Areas are nearly level, slightly depressional, and irregularly shaped. Elevation is 1,900 to 2,000 feet. The average annual temperature is 64 to 67 degrees F, the average annual precipitation is 4 to 6 inches, and the frost-free season is about 240 days.

The soil material is mostly stratified clays, silty clays, or silty clay loams that have some thin strata of coarser textured material.

Internal drainage is very slow. Water often ponds on the surface. Generally, the ponded water is shallow and remains for extended periods in spring. Summer thunderstorms also cause ponding. The water disappears slowly through evaporation or percolation and frequently leaves a salt crust or salt deposit on the surface.

This unit generally is barren, but in places it has a few scattered, salt-tolerant plants.

This unit is very poorly suited to livestock grazing or wildlife habitat.

This unit is in capability subclass VIIIw, nonirrigated.

PME—Pulsipher-Rock outcrop complex, 15 to 30 percent slopes. This map unit is on foothills and on the lower slopes of mountains. Elevation is 3,500 to 4,500 feet. The average annual precipitation is about 8 to 11 inches, the average annual air temperature is 57 to 60 degrees F, and the average frost-free period is about 200 days.

This unit is 65 percent Pulsipher gravelly loam and 20 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Arizo gravelly fine sand and Virgin Peak gravelly loam. Included areas make up less than 15 percent of the total acreage.

The Pulsipher soil is shallow and well drained. It formed in material derived dominantly from metamorphic rock. Typically, the surface layer is grayish brown gravelly loam about 2 inches thick. The subsoil is grayish brown very gravelly sandy loam about 13 inches thick. Unweathered bedrock is at a depth of 15 inches. Depth to bedrock ranges from 12 to 20 inches.

Permeability of the Pulsipher soil is moderately rapid. Available water capacity is very low. Effective rooting depth is about 15 inches. Runoff is slow to medium, and the hazard of water erosion is moderate.

Rock outcrop consists of areas of exposed rock. It is intermingled with areas of the Pulsipher soil.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of blackbrush, white burrobush, yucca, and grasses.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by

shallow depth to rock, very low available water capacity, and steepness of slope.

This unit is in capability subclass VIIs, nonirrigated.

PPE—Pulsipher association, hilly. This map unit is on foothills and the lower slopes of mountains. Slope is 15 to 30 percent. Elevation is 3,500 to 4,500 feet. The average annual precipitation is about 8 to 11 inches, the average annual air temperature is 57 to 60 degrees F, and the average frost-free period is about 200 days.

This unit is 60 percent Pulsipher gravelly loam and 35 percent Pulsipher gravelly clay loam, fine variant. Both soils are in similar positions on the landscape.

Included in this unit are small areas of Arizo gravelly fine sand, St. Thomas stony loam, and Crystal Springs gravelly sandy loam. Included areas make up about 5 percent of the total acreage.

The Pulsipher gravelly loam is shallow and well drained. It formed in material derived dominantly from metamorphic rock. Typically, the surface layer is grayish brown gravelly loam about 2 inches thick. The subsoil is grayish brown very gravelly sandy loam about 13 inches thick. Unweathered bedrock is at a depth of 15 inches. Depth to bedrock ranges from 12 to 20 inches.

Permeability of the Pulsipher gravelly loam is moderately rapid. Available water capacity is very low. Effective rooting depth is about 15 inches. Runoff is slow to medium, and the hazard of water erosion is moderate.

The Pulsipher gravelly clay loam, fine variant, is shallow and well drained. It formed in material derived dominantly from metamorphic rock. Typically, the surface layer is light reddish brown gravelly clay loam about 6 inches thick. The subsoil is reddish yellow gravelly clay about 8 inches thick. Unweathered bedrock is at a depth of 14 inches. Depth to bedrock ranges from 12 to 20 inches.

Permeability of the Pulsipher gravelly clay loam, fine variant, is slow. Available water capacity is very low. Effective rooting depth is about 14 inches. Runoff is rapid, and the hazard of water erosion is moderate.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of blackbrush, white burrobush, yucca, and grasses.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by shallow depth to rock, very low available water capacity, and steepness of slope.

This unit is in capability subclass VIIs, nonirrigated.

PRE—Pulsipher gravelly clay loam, fine variant, 15 to 30 percent slopes. This shallow, well drained soil is on foothills and low mountains. It formed in material derived dominantly from metamorphic rock. Elevation is 3,500 to 4,500 feet. The average annual precipitation is about 8 to 11 inches, the average annual air temperature is 57 to 60 degrees F, and the average frost-free period is about 200 days.

Typically, the surface layer is reddish brown gravelly clay loam about 6 inches thick. The subsoil is yellowish red gravelly clay about 8 inches thick. Unweathered bedrock is at a depth of 14 inches. Depth to bedrock ranges from 12 to 20 inches.

Included in this unit are small areas of St. Thomas stony loam and Crystal Springs gravelly sandy loam. Included areas make up less than 5 percent of the total acreage.

Permeability of this Pulsipher soil is slow. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is moderate.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of blackbrush, white burrobush, yucca, and grasses.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by shallow depth to rock, very low available water capacity, and slope.

This unit is in capability subclass VII, nonirrigated.

Re—Riverwash. This unit is along the flood plains of the Virgin River, Meadow Valley Wash, and the Muddy River. It is nearly level to gently sloping. Elevation is 1,250 to 2,000 feet. Average annual temperature is 64 to 67 degrees F, average annual precipitation is 4 to 6 inches, and the frost-free season is about 240 days.

Riverwash consists mostly of recently deposited gravelly, stony, or cobbly sandy material that has layers of finer textured material. It is derived from mixed rock sources. Riverwash is deep, is highly stratified, and is subject to frequent deposition of fresh sediment.

The hazard of erosion is moderate or high. This unit is subject to frequent flash floods.

This unit is a potential source of sand or gravel.

This unit is in capability subclass VIIIw, nonirrigated.

RME—Rock land-Moapa association, hilly. This map unit is on uplands. Elevation is 2,500 to 3,500 feet. The average annual precipitation is about 6 to 8 inches, the average annual air temperature is 60 to 65 degrees F, and the average frost-free period is about 210 days.

This unit is 60 percent Rock land and 30 percent Moapa fine sand, 4 to 15 percent slopes.

Included in this unit are small areas of Badland, Toquop fine sand, and St. Thomas stony loam. Included areas make up about 10 percent of the total acreage.

Rock land consists of areas that have exposures of sandstone. In some areas soil material covers the bedrock.

The Moapa soil is moderately deep and excessively drained. It formed in residuum and in eolian material

derived dominantly from sandstone. Typically, the surface layer is light yellowish brown fine sand about 4 inches thick. The underlying material to a depth of 26 inches is light yellowish brown fine sand. Weathered bedrock is at a depth of 30 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Moapa soil is very rapid. Available water capacity is very low. Effective rooting depth is about 30 inches. Runoff is very slow, and the hazard of water erosion is moderate.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, big galleta, and Indian ricegrass. There are a few Joshua-trees.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by the areas of Rock land, low precipitation, and the very low available water capacity of the Moapa soil.

Rock land is in capability subclass VIIIs, nonirrigated. The Moapa soil is in capability subclass VIIs, nonirrigated.

RTF—Rock land-St. Thomas association, very steep. This map unit is on foothills and mountainsides. Elevation is 1,600 to 2,100 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 66 to 68 degrees F, and the average frost-free period is about 240 days.

This unit is 60 percent Rock land and 30 percent St. Thomas cobbly loam, 15 to 50 percent slopes.

Included in this unit are small areas of Tonopah very gravelly sandy loam. Included areas make up about 10 percent of the total acreage.

Rock land consists of areas that have exposures of limestone bedrock. In some areas soil material covers the bedrock.

The St. Thomas soil is shallow and well drained. It formed in residuum derived dominantly from limestone. Typically, the surface layer is very pale brown cobbly loam about 2 inches thick. The underlying material to a depth of 12 inches is very pale brown very cobbly loam. Unweathered bedrock is at a depth of 12 inches. Depth to bedrock ranges from 4 to 20 inches.

Permeability of the St. Thomas soil is moderately rapid. Available water capacity is very low. Effective rooting depth is about 12 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, big galleta, range ratany, white bitterbrush, and Indian ricegrass.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by the areas of Rock land, which produces no vegetation. The St. Thomas soil is shallow to rock, has very low available water capacity, and receives low precipitation.

Rock land is in capability subclass VIIIs, nonirrigated. The St. Thomas soil is in capability subclass VIIe, nonirrigated.

SP—Spring silty clay loam. This deep, moderately well drained soil is on terraces. It formed in material derived dominantly from gypsiferous lacustrine sediment. Slope is 0 to 2 percent. Elevation is 1,600 to 2,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is light reddish brown silty clay loam about 5 inches thick. The underlying material to a depth of 60 inches is pink clay loam and silt loam.

Included in this unit are small areas of Glendale loam, Mormon Mesa fine sandy loam, Tonopah gravelly sandy loam, and Badland. Included areas make up less than 10 percent of the total acreage.

Permeability of this Spring soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium to rapid, and the hazard of water erosion is slight. This soil is rarely flooded. It is high in gypsum and is strongly salt affected.

This unit is used for livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of shadscale, desertholly, Torrey seepweed, Fremont dalea, and annual grasses.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by the high content of salts and low precipitation.

This unit is in capability subclass VIIs, nonirrigated.

Tb—Tobler fine sandy loam. This deep, well drained soil is on flood plains and low alluvial fans. It formed in alluvium derived dominantly from sandstone, shale, and limestone. Slope is 0 to 2 percent. Elevation is 1,500 to 2,500 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 63 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is light reddish brown fine sandy loam about 13 inches thick. The underlying material to a depth of 60 inches is light reddish brown, stratified silt loam, fine sandy loam, and loamy fine sand.

Included in this unit are small areas of Bluepoint loamy fine sand and Calico fine sandy loam. Included areas make up less than 5 percent of the total acreage.

Permeability of this Tobler soil is moderately rapid. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to occasional, very brief periods of flooding.

This unit is used for irrigated crops, mainly row crops, alfalfa, small grain, and mixed grass and legume pasture.

This unit is well suited to irrigated crops. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

If this unit is used for alfalfa for hay, it provides aftermath grazing. The productivity of this unit can be maintained by proper grazing use and pasture management.

Windbreaks are suitable for use on this unit. They protect the farmstead, reduce damage to seedlings, have esthetic value, and provide habitat for some species of wildlife.

This map unit is poorly suited to homesite development. The main limitation is the hazard of flooding. Protection from flooding can be provided by the construction of extensive dikes.

This unit is in capability subclass IIw, irrigated.

Tc—Tobler fine sandy loam, strongly saline. This deep, wet, salt-affected soil is on flood plains and low alluvial fans. The drainage has been altered by excessive irrigation of adjacent soils. The soil formed in alluvium derived dominantly from sandstone, shale, and limestone. Slope is 0 to 2 percent. Elevation is 1,500 to 2,500 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 63 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is light reddish brown fine sandy loam about 13 inches thick. The underlying material to a depth of 60 inches is light reddish brown, stratified fine sandy loam, loamy fine sand, and silt loam.

Included in this unit are small areas of a Calico fine sandy loam that is slightly wet and slightly saline. Also included are small areas of other Tobler soils that are slightly wet. Included areas make up less than 5 percent of the total acreage.

Permeability of this Tobler soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table is at a depth of 2 to 5 feet in winter. This soil is subject to occasional, very brief periods of flooding. It is strongly salt affected.

This unit is used for livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of alkali sacaton, inland saltgrass, arrowweed pluchea, big saltbush, and fourwing saltbush.

This unit is poorly suited to livestock grazing. Excess salts limit the production of forage mainly to salt-tolerant species. Forage is of low quality, and most of it is not usable by livestock.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding and the depth to the water table. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table. Seepage from these systems can pollute water supplies and thus create a hazard to health. Deep drains can be used to lower the water table.

This unit is in capability subclass VIIw, nonirrigated.

Td—Tobler silt loam, wet. This deep, wet soil is on flood plains and low terraces. The drainage has been altered by excessive irrigation of adjacent soils. The soil formed in alluvium derived dominantly from sandstone, shale, and limestone. Slope is 0 to 2 percent. Elevation is 1,500 to 2,500 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is light reddish brown silt loam about 13 inches thick. The underlying material to a depth of 60 inches or more is light reddish brown, stratified silt loam to loamy fine sand. It is dominantly fine sandy loam.

Included in this unit are small areas of Tobler fine sandy loam, strongly saline, and Tobler silt loam, strongly saline. Included areas make up less than 5 percent of the total acreage.

Permeability of this Tobler soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. A seasonal high water table is at a depth of 4 to 5 feet in spring. This soil is subject to occasional, very brief periods of flooding.

This unit is used for irrigated crops, mainly row crops, alfalfa, small grain, and mixed grass and legume pasture.

This unit is well suited to irrigated crops. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the raising of the water table, using conservation cropping systems, and returning crop residue to the soil.

Where this unit is used for alfalfa for hay, it provides aftermath grazing. The productivity of this unit can be maintained by proper grazing use and pasture management.

Windbreaks are suitable for use on this unit. They protect the farmstead, reduce damage to seedlings, have esthetic value, and provide habitat for some species of wildlife.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding and the depth to the water table. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table. Seepage from these systems can pollute water supplies and

thus create a hazard to health. Deep drains can be used to lower the water table.

This unit is in capability subclass IIw, irrigated.

Te—Tobler clay, strongly saline. This deep, wet soil is on flood plains and low alluvial fans. Drainage has been altered by excessive irrigation of adjacent soils. The soil formed in alluvium derived dominantly from sandstone, shale, and limestone. Slope is 0 to 2 percent. Elevation is 1,500 to 2,500 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 63 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is light reddish brown clay about 13 inches thick. The underlying material to a depth of 60 inches is light reddish brown, stratified loamy fine sand and silt loam.

Included in this unit are small areas of Virgin River silty clay, strongly saline, and Bluepoint loamy fine sand. Included areas make up less than 5 percent of the total acreage.

Permeability of this Tobler soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The water table is at a depth of 2 to 5 feet in winter. This soil is subject to occasional, very brief periods of flooding. It is strongly salt affected.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of alkali sacaton, inland saltgrass, arrowweed pluchea, big saltbush, and fourwing saltbush.

This unit is poorly suited to livestock grazing. Excess salts limit the production of forage mainly to salt-tolerant species. Forage is of low quality, and most of it is not usable by livestock.

This unit is poorly suited to crops. It is limited mainly by lack of readily available water for irrigation, high content of soluble salts, and wetness.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding and the depth to the water table. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table. Seepage from these systems can pollute water supplies and thus create a hazard to health. Deep drains can be used to lower the water table.

This unit is in capability subclass VIIw, nonirrigated.

THB—Tonopah gravelly sandy loam, 0 to 4 percent slopes. This deep, excessively drained soil is on alluvial fans and terraces. It formed in sandy alluvium derived from mixed rock sources. Elevation is 1,500 to 3,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 61 to 66 degrees F, and the average frost-free period is 240 days.

Typically, the surface layer is light brown gravelly sandy loam about 6 inches thick. The underlying material to a depth of 60 inches or more is light brown very gravelly sand.

Included in this unit are small areas of Bard gravelly fine sandy loam, Arizo gravelly fine sand, Colorock gravelly fine sandy loam, and St. Thomas cobbly loam. Included areas make up about 10 percent of the total acreage.

Permeability of this Tonopah soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is rarely flooded.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of creosotebush, big galleta, Indian ricegrass, and white bursage.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by very low available water capacity and low precipitation.

This unit is in capability subclass VIIs, nonirrigated.

TMD—Tonopah very gravelly sandy loam, 4 to 15 percent slopes. This deep, excessively drained soil is on alluvial fans and terraces. It formed in sandy alluvium derived dominantly from mixed rock sources. Elevation is 1,500 to 3,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 61 to 64 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is light brown very gravelly sandy loam about 6 inches thick. The underlying material to a depth of 60 inches or more is light brown very gravelly sand.

Included in this unit are small areas of Crystal Springs gravelly sandy loam, St. Thomas cobbly loam, Mormon Mesa loamy fine sand, Flattop gravelly clay loam, and Badland. Included areas make up about 10 percent of the total acreage.

Permeability of this Tonopah soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. This soil is rarely flooded.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of creosotebush, big galleta, Indian ricegrass, white bursage, and perennial grasses.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by very low available water capacity and low precipitation.

This unit is in capability subclass VIIs, nonirrigated.

TnA—Toquop fine sand, 0 to 2 percent slopes. This deep, excessively drained soil is on alluvial fans and low terraces. It formed in sandy alluvium derived dominantly

from sandstone. Elevation is 1,400 to 2,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is pink fine sand about 9 inches thick. The underlying material to a depth of 60 inches or more is pink fine sand.

Included in this unit are small areas of a Toquop fine sand that has a high water table; Toquop silty clay loam, strongly saline; and Badland. Included areas make up less than 10 percent of the total acreage.

Permeability of this Toquop soil is very rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. This soil is rarely flooded.

This unit is used for livestock grazing and for wildlife habitat. It is also used for irrigated crops where water for irrigation is available.

The present vegetation on this unit is mainly a sparse stand of alkali sacaton, inland saltgrass, creosotebush, white bursage, big galleta, Indian ricegrass, big saltbush, and fourwing saltbush.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by sandy texture and low precipitation. In springs when there is adequate moisture, the unit produces a large quantity of annual plants.

This unit is suited to irrigated crops. It can be used for row crops, small grain, alfalfa, and grass and legume pasture. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

Windbreaks are suitable for use on this unit. They protect the farmstead, help to control soil blowing, reduce damage to seedlings, have esthetic value, and provide habitat for some species of wildlife.

This unit is poorly suited to homesite development. The main limitations are the hazards of flooding, soil blowing, and seepage. Protection from flooding can be provided by the construction of extensive dikes. Seepage from onsite sewage disposal systems can pollute water supplies and create a hazard to health. To control soil blowing, only the part of the site that is used for construction should be disturbed.

This unit is in capability subclass IVs, irrigated, and VIIs, nonirrigated.

TnB—Toquop fine sand, 2 to 8 percent slopes. This deep, excessively drained soil is on alluvial fans and terraces. It formed in sandy alluvium derived dominantly from sandstone. Elevation is 1,400 to 2,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is pink fine sand about 9 inches thick. The underlying material to a depth of 60 inches or more is pink fine sand and sand.

Included in this unit are small areas of Alluvial land, Arizo very gravelly loamy sand, and Virgin River silty clay. Included areas make up less than 10 percent of the total acreage.

Permeability of this Toquop soil is very rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is moderate. The hazard of soil blowing is high. This soil is rarely flooded.

This unit is used for livestock grazing and for wildlife habitat. It can be used for irrigated crops if water for irrigation is made available.

The present vegetation on this unit is mainly a sparse stand of alkali sacaton, inland saltgrass, creosotebush, white bursage, big galleta, Indian ricegrass, big saltbush, and fourwing saltbush.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by sandy texture and low precipitation. In springs when moisture is adequate, the unit produces a large amount of annual plants.

This unit is poorly suited to crops. It is limited mainly by lack of readily available water for irrigation and slope. If irrigated, it is suited to crops such as row crops, small grain, alfalfa, and mixed grass and legume pasture. If this unit is used for crops, it needs to be leveled.

If this unit is used for irrigated crops, windbreaks are needed to control soil blowing when the soil is bare or dry.

This unit is poorly suited to homesite development. The main limitations are the hazards of flooding, soil blowing, and seepage. Protection from flooding can be provided by the construction of extensive dikes. Seepage from onsite sewage disposal systems can pollute water supplies and thus create a hazard to health. Erosion is a hazard in the steeper areas. To control soil blowing, only the part of the site that is used for construction should be disturbed.

This unit is in capability subclass VIIs, nonirrigated.

TsA—Toquop fine sand, water table, 0 to 2 percent slopes. This deep, wet soil is on alluvial fans and low terraces. It formed in sandy alluvium derived dominantly from sandstone. Drainage has been altered by seepage from irrigation ditches and is influenced by the position of the soil adjacent to the river. Elevation is 1,400 to 2,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is pink fine sand about 9 inches thick. The underlying material to a depth of 60 inches or more is pink fine sand and sand.

Included in this unit are small areas of Alluvial land, Arizo very gravelly loamy sand, and a Toquop fine sand that is strongly saline but does not have a water table. Included areas make up less than 5 percent of the total acreage.

Permeability of this Toquop soil is very rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. The water table is at a depth of 4 to 6 feet throughout the year. This soil is rarely flooded.

This unit is used for livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of alkali sacaton, inland saltgrass, big saltbush, fourwing saltbush, and mesquite.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by very low available water capacity and low precipitation. In years when adequate moisture is available in spring, the unit produces a large quantity of annuals.

This unit is poorly suited to crops. It is limited mainly by lack of readily available water for irrigation, sandy texture, very low available water capacity, and depth to the water table. This unit is only 3 to 4 feet above the water level of the river.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding and depth to the water table. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table. Seepage from these systems can pollute water supplies and thus create a hazard to health. Deep drains can be used to lower the water table if suitable outlets can be located.

This unit is in capability subclass VIIw, nonirrigated.

TtA—Toquop fine sandy loam, 0 to 2 percent slopes. This deep, excessively drained soil is on alluvial fans and low terraces. It formed in sandy alluvium derived dominantly from sandstone. Elevation is 1,400 to 2,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is pink fine sandy loam about 9 inches thick. The underlying material to a depth of 60 inches or more is pink fine sand and sand.

Included in this unit are small areas of Alluvial land, Black Butte silt loam, and Virgin River silty clay. Included areas make up less than 10 percent of the total acreage.

Permeability of this Toquop soil is very rapid. Available water capacity is very low to low. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is rarely flooded.

Most areas of this unit are used for irrigated crops, mainly small grain, alfalfa, and mixed grass and legume pasture.

This unit is suited to irrigated crops. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

Where this unit is used for alfalfa for hay, it provides aftermath grazing. The productivity of this unit can be maintained by proper grazing use and pasture management.

Windbreaks are suitable for use on this unit. They protect the farmstead, reduce damage to seedlings, have esthetic value, and provide habitat for some species of wildlife.

This unit is poorly suited to homesite development. The main limitations are the hazards of flooding and seepage. Protection from flooding can be provided by the construction of extensive dikes. Seepage from onsite sewage disposal systems can pollute water supplies and thus create a hazard to health.

This unit is in capability subclass IVs, irrigated.

TuA—Toquop fine sandy loam, water table, 0 to 2 percent slopes. This deep, wet soil is on alluvial fans and low terraces. It formed in sandy alluvium derived dominantly from sandstone. Drainage has been altered by seepage from irrigation ditches and is influenced by the position of the soil adjacent to the river. Elevation is 1,400 to 2,000 feet. The average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is pink fine sandy loam about 9 inches thick. The underlying material to a depth of 60 inches or more is pink fine sand and sand.

Included in this unit are small areas of Alluvial land, Toquop fine sand, and Arizo gravelly fine sand. Included areas make up less than 5 percent of the total acreage.

Permeability of this Toquop soil is very rapid. Available water capacity is very low to low. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The water table is at a depth of 4 to 6 feet in winter.

This unit is used for irrigated crops, mainly small grain, alfalfa, and mixed grass and legume pasture.

This unit is suited to irrigated crops. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent raising of the water table, using conservation cropping systems, and returning crop residue to the soil.

Where this unit is used for alfalfa for hay, it provides aftermath grazing. The productivity of this unit can be maintained by proper grazing use and pasture management.

Windbreaks are suitable for use on this unit. They protect the farmstead, reduce damage to seedlings, have esthetic value, and provide habitat for some species of wildlife.

This unit is poorly suited to homesite development. The main limitations are the hazards of flooding and seepage and the depth to the water table. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table. Seepage from these systems can pollute water supplies and thus create a hazard to health. Deep drains can be used to lower the water table if suitable outlets can be located.

This unit is in capability subclass IVw, irrigated.

TvA—Toquop silty clay loam, strongly saline, 0 to 2 percent slopes. This deep, wet soil is on alluvial fans and low terraces. It formed in sandy alluvium derived dominantly from sandstone. Drainage has been altered by seepage from irrigation ditches and is influenced by the position of the soil adjacent to the river. Elevation is 1,400 to 2,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is pink silty clay loam about 9 inches thick. The underlying material to a depth of 60 inches or more is pink fine sand and sand.

Included in this unit are small areas of a Toquop fine sandy loam that has a high water table, a Toquop fine sand that is slightly steeper than this Toquop soil, and Toquop fine sand. Included areas make up less than 10 percent of the total acreage.

Permeability of this Toquop soil is very rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The water table is at a depth of 4 to 6 feet in winter. This soil is rarely flooded. It is strongly salt affected.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of alkali sacaton, inland saltgrass, Torrey seepweed, big saltbush, and mesquite.

This unit is poorly suited to livestock grazing. Excess salts limit the production of forage mainly to salt-tolerant species. Forage is of low quality, and most of it is not usable by livestock.

This unit is poorly suited to crops. It is limited mainly by lack of readily available water for irrigation and content of salts. Drainage of the unit is not practical unless suitable outlets can be located, because it is only 3 or 4 feet above the level of the water in the river.

This unit is poorly suited to homesite development. The main limitations are the hazards of flooding and seepage and the depth to the water table. Protection from flooding can be provided by the construction of dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table. Seepage from these systems can pollute water supplies and thus create a hazard to health. Deep drains can be used to lower the water table if suitable outlets can be located.

This unit is in capability subclass VIIw, nonirrigated.

Vd—Vinton fine sandy loam. This deep, well drained soil is on flood plains and low terraces. It formed in sandy alluvium derived dominantly from mixed rock sources. Slope is 0 to 4 percent. Elevation is 1,400 to 2,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 57 to 64 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is brown fine sandy loam about 12 inches thick. The underlying material to a depth of 60 inches or more is yellowish brown loamy sand and fine sand.

Included in this unit are small areas of Black Butte silt loam that is slightly wet and slightly saline. Also included are small areas of Tonopah very gravelly sandy loam. Included areas make up less than 5 percent of the total acreage.

Permeability of this Vinton soil is rapid. Available water capacity is low to moderate. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is rarely flooded.

This unit is used mainly for irrigated crops, mainly alfalfa, small grain, and mixed grass and legume pasture. It is also used for livestock grazing and wildlife habitat.

This unit is suited to irrigated crops. Management practices that are suited to this unit are leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent the development of a high water table, using conservation cropping systems, and returning crop residue to the soil.

Where this unit is used for alfalfa for hay, it provides aftermath grazing. The productivity of this unit can be maintained by proper grazing use and pasture management.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by low precipitation, low available water capacity, and sandy texture. When available moisture is adequate in spring, this unit produces a large amount of annual plants.

Windbreaks are suitable for use in irrigated areas of this unit. They protect the farmstead, reduce damage to

seedlings, have esthetic value, and provide habitat for some species of wildlife.

This unit is poorly suited to homesite development. The main limitations are the hazards of flooding and seepage. Protection from flooding can be provided by the construction of extensive dikes. Seepage from onsite sewage disposal systems can pollute water supplies and thus create a hazard to health.

This unit is in capability subclass IIIs, irrigated.

VEF—Virgin Peak-Rock land association, very steep. This map unit is on mountainsides. Elevation is 4,800 to 8,000 feet. The average annual precipitation is about 12 to 20 inches, the average annual air temperature is 51 to 56 degrees F, and the average frost-free period is 120 to 160 days.

This unit is 50 percent Virgin Peak very gravelly loam, 30 to 75 percent slopes, and 35 percent Rock land. Rock land is intermingled with areas of the Virgin Peak soil.

Included in this unit are small areas of Garr very cobbly sandy loam, Nickel gravelly sandy loam, and Arizo very gravelly loamy sand. Included areas make up about 15 percent of the total acreage.

The Virgin Peak soil is shallow and well drained. It formed in residuum derived dominantly from mixed rock sources. Typically, the surface layer is brown very gravelly loam about 6 inches thick. It is underlain by weathered bedrock that grades to unweathered bedrock at a depth of 14 inches. Depth to unweathered bedrock ranges from 13 to 20 inches.

Permeability of the Virgin Peak soil is moderately rapid. Available water capacity is very low. Effective rooting depth is about 14 inches. Runoff is medium, and the hazard of water erosion is moderate.

Rock land consists of areas that have exposures of gneiss. In some areas soil material covers the bedrock.

This unit is used for very limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of big sagebrush, Stansbury cliffrose, needleandthread, turbinella oak, and blue grama. There are a few scattered pinyon and juniper trees.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by shallow depth, very low available water capacity, steepness of slope, and the areas of Rock land.

This unit is in capability subclass VIIs, nonirrigated.

Vg—Virgin River silty clay. This deep, somewhat poorly drained soil is on flood plains. It formed in clayey alluvium derived dominantly from mixed sedimentary rock sources. Slope is 0 to 2 percent. Elevation is 4,800 to 8,000 feet. The average annual precipitation is about 12 to 20 inches, the average annual air temperature is 51 to 56 degrees F, and the average frost-free period is 120 to 160 days.

Typically, the surface layer is light reddish brown silty clay about 6 inches thick. The upper 29 inches of the underlying material is light reddish brown, stratified clay loam and clay, and the lower part to a depth of 60 inches or more is light reddish brown, stratified fine sand to silt loam.

Included in this unit are small areas of Gila loam, Overton silty clay, slightly saline; Toquop fine sandy loam; and other Virgin River soils. Included areas make up less than 10 percent of the total acreage.

Permeability of this Virgin River soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The water table is at a depth of 4 to 6 feet in winter. This soil is occasionally flooded. It is slightly salt affected.

Most areas of this unit are used for irrigated crops, mainly alfalfa, mixed grass and legume pasture, small grain, and row crops.

This unit is suited to irrigated crops. It is limited mainly by the hazard of flooding, the high water table, and the content of soluble salts. Extensive dikes and levees are needed to protect this unit from flooding. When protected from flooding, the unit is suited to such practices as leveling to improve the application of irrigation water, using irrigation systems that meet the needs of the crops grown, managing irrigation water so as to prevent raising the water table, using conservation cropping systems, and returning crop residue to the soil. Deep drains can be used to control the level of the water table and allow salts to be removed by leaching.

Where this unit is used for alfalfa for hay, it provides aftermath grazing. The productivity of this unit can be maintained by proper grazing use and pasture management.

Windbreaks are suitable for use on this unit. They protect the farmstead, reduce damage to seedlings, have esthetic value, and provide habitat for some species of wildlife.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding, slow permeability, and the depth to the water table. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table and slow permeability. Deep drains can be used to lower the water table.

This unit is in capability subclass IIIw, irrigated.

Vn—Virgin River silty clay, strongly saline. This deep, somewhat poorly drained soil is on flood plains. It formed in clayey alluvium derived dominantly from mixed sedimentary rock sources. Slope is 0 to 2 percent. Elevation is 1,400 to 1,600 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is light reddish brown silty clay about 6 inches thick. The upper 29 inches of the underlying material is light reddish brown, stratified clay loam and clay. The lower part to a depth of 60 inches is light reddish brown, stratified fine sand to silt loam.

Included in this unit are small areas of Gila loam, slightly wet; Overton silty clay, slightly saline; Toquop fine sandy loam; and Virgin River silty clay, slightly saline. Included areas make up less than 10 percent of the total acreage.

Permeability of this Virgin River soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. A seasonal high water table is at a depth of 4 to 6 feet in winter. This soil is occasionally flooded. It is strongly salt affected.

This unit is used for livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of alkali sacaton, inland saltgrass, big saltbush, fourwing saltbush, and mesquite.

This unit is poorly suited to livestock grazing. Excess salts limit the production of forage mainly to salt-tolerant species. Forage is of low quality, and most of it is not usable by livestock.

This unit is poorly suited to crops. It is limited mainly by lack of readily available water for irrigation, slow permeability, clayey texture, the seasonal high water table, and the high content of soluble salts.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding, slow permeability, and the depth to the water table. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table and slow permeability. Deep drains can be used to lower the water table.

This unit is in capability subclass VIIw, nonirrigated.

Vr—Virgin River silty clay loam, wet variant. This deep, poorly drained soil is on flood plains. It formed in clayey alluvium derived dominantly from limestone, sandstone, and shale. Slope is 0 to 2 percent. Elevation is 1,400 to 1,600 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 64 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is reddish brown silty clay loam about 6 inches thick. The upper 22 inches of the underlying material is light reddish brown silty clay loam. The lower part to a depth of 60 inches or more is pink fine sand.

Included in this unit are small areas of Riverwash, Toquop fine sand, Toquop fine sandy loam, and a Virgin River silty clay that is slightly wet and slightly saline. Included areas make up less than 5 percent of the total acreage.

Permeability of this Virgin River soil is slow. Available water capacity is moderate to high. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. A seasonal high water table is at a depth of 1.5 to 3.0 feet in winter. This soil is subject to occasional, very brief periods of flooding in winter. It is strongly salt affected.

This unit is used for livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of alkali sacaton, inland saltgrass, fourwing saltbush, Torrey seepweed, and mesquite.

This unit is poorly suited to livestock grazing. Excess salts limit the production of forage mainly to salt-tolerant species. Forage is of low quality, and most of it is not usable by livestock.

This unit is poorly suited to crops. It is limited mainly by lack of readily available water for irrigation, clayey texture, slow permeability, depth to the water table, and the high content of soluble salts.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding, slow permeability, and the depth to the water table. Protection from flooding can be provided by the construction of extensive dikes. Onsite sewage disposal systems may not function properly on this unit because of the depth to the water table and slow permeability. Seepage from these systems can pollute water supplies and thus create a hazard to health. Deep drains can be used to lower the water table.

This unit is in capability subclass VIIw, nonirrigated.

WEE—Weiser cobbly sandy loam, 15 to 30 percent slopes. This deep, well drained soil is on alluvial fans. It formed in gravelly and cobbly alluvium derived dominantly from limestone. Elevation is 2,000 to 3,000 feet. The average annual precipitation is about 4 to 6 inches, the average annual air temperature is 61 to 67 degrees F, and the average frost-free period is about 240 days.

Typically, the surface layer is pink cobbly sandy loam about 6 inches thick. The underlying material to a depth of 60 inches or more is pink very gravelly fine sandy loam and very gravelly sandy loam.

Included in this unit are small areas of Badland, St. Thomas stony loam, Tonopah very gravelly sandy loam, and Rock land. Included areas make up less than 10 percent of the total acreage.

Permeability of this Weiser soil is moderately rapid. Available water capacity is very low to low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for limited livestock grazing and for wildlife habitat.

The present vegetation on this unit is mainly a sparse stand of creosotebush, white bursage, big galleta, Indian ricegrass, range ratany, and ephedra.

This unit is poorly suited to livestock grazing. The production of forage usable by livestock is limited by very low available water capacity and low precipitation.

This unit is in capability subclass VIIe, nonirrigated.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture, rangeland, and woodland, as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities, and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the estimated yields of the main crops and hay and pasture plants are presented for each soil and the system of land capability classification used by the Soil Conservation Service is explained.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

The aim of good land use is to produce the greatest amount of the most needed crops, while protecting and improving the soil. To achieve this aim, the land must be protected according to its needs and used within its capabilities. This can be done by using plants that are well suited to the soil, applying soil management practices that protect the soil, and keeping the soil in good physical condition.

In the following paragraphs the principal soil management practices needed in the survey area are generally described. Although the soils in the survey area differ in management needs, certain practices apply to all the soils that are cultivated.

Conservation cropping systems.—A conservation cropping system is the growing of crops in combination with needed cultural and management measures. If soil-improving crops and practices more than offset the soil-depleting crops and deteriorating practices, then it is a good conservation cropping system.

Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes, the return of crop residue to the soil, proper tillage, adequate fertilization, weed- and pest-control measures, and other good management practices.

Several cropping systems are used in the survey area. A typical one is alfalfa grown for about 6 to 8 years, small grain or field corn for 2 years, and then back to alfalfa with a protective nurse crop of oats. The crop residue of the small grain or field corn is returned to the soil, and tillage is reduced to only those operations that are necessary.

Crop residue mangement.—Crop residue management is the use of plant residue left in cultivated fields. It is done by incorporating the residue into the soil or leaving it on the surface during that part of the year when erosion is likely to occur. Plant residue adds organic matter. A major benefit of organic matter in the soil is its influence on the development and stabilization of good soil

structure and its relationship to the general physical environment of the soil, which influences crop growth. Organic matter functions mainly as it decomposes. The application of nitrogen fertilizer to the soil aids in this process.

It is particularly important that organic matter be continuously returned to the soil. The easiest and most common way to add organic matter to the soil is to return plant residue produced by a crop. Unless sufficient crop residue is returned to the soil, the physical condition of the soil declines, soil compaction starts, and slower water infiltration and poorer aeration result.

Erosion control.—Erosion control prevents the excessive wearing away of the land surface by wind, running water, and other geological agents. The protection of the surface layer is important, because it contains most of the organic matter and generally is more fertile than the subsoil. Erosion can be controlled by using cover crops to protect the surface during windy or stormy periods of the year; by leveling in spring and then seeding right away; and by leveling to the proper grade and applying water at the proper rate.

Addition of plant nutrients.—Most of the irrigated soils used for crops in this survey area respond well to liquid or solid fertilizer. The specific fertilizer needed depends on the kind of crop grown and the nutrient level in the soil. Applying a combination fertilizer that contains nitrogen and phosphate increases production of small grain and aids in establishing alfalfa. Thereafter, alfalfa benefits from phosphate applied every 2 years for the life of the stand, except where the soil contains enough available phosphorus.

Barnyard manure adds some nitrogen, phosphate, and potassium to the soil and promotes good tilth. If barnyard manure is available, it can be used with good results before planting corn or small grain.

Irrigation water management.—Irrigation water management concerns regulation of applications of irrigation water at rates and amounts that will insure high crop production and minimum soil and water losses. It is needed in all irrigated areas. Good irrigation means applying water according to the crop needs and at rates and in amounts consistent with the characteristics of the soil.

Efficient delivery of water to farms is the first step in supplying the moisture needed by growing crops. A good distribution system is one that has enough capacity to meet the needs of the crops irrigated, that is so located and controlled that seepage losses are negligible, and that carries the required flow safely.

Next, the water must be delivered from the distribution system to the individual fields. An efficient system for transporting water on a farm or ranch is so designed and constructed that it carries the required flow without excessive seepage and without causing erosion. Control structures are needed to facilitate the handling of water.

The design of an irrigation system is governed by the method of irrigation to be used, the amount of land leveling needed, and the expected efficiency in applying water. In this survey area two methods of irrigation are commonly used: border and furrow. Border irrigation, the most commonly used method, consists of applying water to strips of varying width that are separated by low dikes or border ridges. It is suitable on fields in close-growing crops. It can be effectively used on all soils that can be leveled and that have a basic water-intake rate of not more than 3 inches per hour. Furrow irrigation consists of applying water downslope in small trenches 2 to 12 inches deep. The length and the spacing of furrows depend on soil texture and the kind of crop. Furrow irrigation is suitable on fields in row crops. It can be used on all soils except those that have a high intake rate and poor lateral movement of water.

If the water is to be applied efficiently, a farmer needs to know the capacity of the soil to hold water that plants can use, the rate that water enters and moves through the soil, and the amount of water required by the crop. Most crops should be irrigated when 40 to 50 percent of the available moisture has been depleted from the top half of the root zone of the plant. Forty-eight hours after irrigation, a soil check can be made to determine whether the desired moisture was added.

Drainage.—Drainage is a major concern in this survey area. In some places where the water table has been lowered, the production of alfalfa hay, meadow hay, and pasture has been greatly increased.

A fluctuating water table is present in the soils on the lower part of the flood plains in the area. One major factor contributing to the high water table is the fact that many of the soils are only slightly higher than the water level in the rivers, so seepage from the rivers into these soils is common. Excessive irrigation has also helped to raise the water table in some of the lower lying soils.

In the soils that are inadequately drained, soluble salts and alkali accumulate and then retard or prevent the growth of crops. Also, the soils that are inadequately drained have poor soil aeration, which reduces growth of plants and increases susceptibility of plants to diseases.

Even the soils that are moderately well drained to well drained must have drainage established if they are to be reclaimed. The reclamation processes require large amounts of water to leach the salts from the root zone and drains to dispose of surface and subsurface water.

Managing saline soils.—Like most soils in arid and subarid regions, the soils in this survey area contain at least small quantities of soluble salts and alkali. Because rainfall is low and evaporation is high, percolating rainfall is insufficient to leach salts out of the root zone. In some soils the salts and alkali are highly concentrated and limit or prevent the growth of crops. In addition, many low-lying areas receive salty water from runoff or seepage. Surface evaporation of such water generally results in a further increase of soluble salts on or in the soils. In

some areas that have a high water table, water may rise in the soil by capillary action and carry dissolved salts with it. Soluble salts are readily dissolved in water and can move to any part of the soil profile.

A soil that contains excessive amounts of soluble salts but not alkali is called a saline soil. One that contains excessive adsorbed sodium is called an alkali soil. A soil that contains both excess soluble salts and alkali is described as saline-alkali. Only saline soils occur in the Virgin River Area.

Saline phases of several of the soils have been mapped. These classes are:

1. Soils that are free of excess salts and contain iess than 0.15 percent salts. The conductivity of the saturation extract is less than 4 millimhos per centimeter at 25 degrees C.
2. Slightly saline soils that contain 0.15 to 0.35 percent salts or in which the conductivity of the saturation extract is 4 to 8 millimhos per centimeter at 25 degrees C.
3. Strongly saline soils that contain more than 0.65 percent salts or in which the conductivity of the saturation extract is greater than 15 millimhos per centimeter at 25 degrees C.

Although a distinct gap occurs between the second class and the third, an intermediate or moderate class is not needed in this survey area, because a very small percentage of the samples analyzed was moderately saline.

Some soils mapped as slightly saline are free of excess salts in the uppermost 4 or 5 inches, but they contain slight or moderate concentrations just below the plow layer. Several soils mapped as strongly saline are only slightly affected in the plow layer.

Soils differ in the kinds of salt they contain and in the practices needed for improvement. For this reason, each soil requires individual treatment; however, some general guidelines can be given that should be helpful.

A good supply of irrigation water and adequate drainage must be provided to reclaim any soil in this area. Two methods of applying water for reclamation are commonly used. One method is to level the areas to basins and then pond the water within these basins. The other method requires that the areas be leveled to a uniform grade and then flooded between the border dikes. If drainage is adequate and large amounts of water are used, either method is effective in leaching the soluble salts out of the root zone.

Proper pasture management.—Proper pasture management is grazing pasture at a rate that maintains grasses and legumes of high quality. This objective can be accomplished by adjusting the stocking rates or season of use to favor maximum growth and survival.

A common method of pasture management is to use several pastures with a rotation system that allows adequate regrowth in each. Care should be taken to keep the livestock off the pastures when they are wet. If livestock are allowed to graze when the pastures are wet, the soil is compacted, the intake rate is decreased, and the structure is destroyed. The pastures should have proper irrigation water management, and drainage should be provided. Increased yields can be obtained by applying commercial fertilizers and barnyard manure if it is available. Weeds generally can be controlled by mowing. Droppings of manure can be spread with a drag each spring.

Hayland management.—Hayland management is the proper treatment and use of hayland to prolong the life of desirable forage species, to maintain or improve the quality and quantity of the forage, and to protect the soil and reduce the water loss. This includes the establishment and renovation of alfalfa type hayfields with long-term stands of adapted species.

An important method of increasing crop yield is through the use of adapted species. For renovation and establishment of hayland, plants should be selected that will withstand climatic extremes and still produce high yields during the relatively short growing season. The seed must be high quality certified seed. Inoculated seed should be used in planting. Land leveling, grading, shaping, and subsoiling should be completed prior to seedbed preparation. A year in an annual crop prior to reestablishing a forage crop allows for weed control, final smoothing, and erosion control after harvesting of the crop. Seed may be drilled directly into the stubble of the prior annual crop. Irrigation prior to planting may be necessary to prepare a seedbed.

Companion crops may be essential if soil blowing is a hazard. Disease is best controlled by the use of resistant species, crop rotation, and proper irrigation management.

Fertilization is essential to ensure that growth factors are not limiting. Fertilization rates are dependent upon the soil and the crop grown.

The management of established stands should regulate the frequency and amount of irrigation water applied. The frequency and amount of irrigation water to be applied are dependent upon the available water capacity of the soil and the rate of removal of water from the soil by evapotranspiration. Subirrigation requires special irrigation water management to control the level of the water table and to prevent the accumulation of excess soluble salts.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil or that a given crop is not commonly irrigated.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 5.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown; that good quality irrigation water is uniformly applied in proper amounts as needed; and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of the soils for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, all kinds of soil are grouped at three levels: capability class, subclass, and unit. Capability classes and subclasses are defined in the following paragraphs. A survey area may not have soils of all classes.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and landforms have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class; they are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability subclass is identified in the description of each soil map unit in the section "Soil maps for detailed planning."

Rangeland

By Harlan G. Arnold, range conservationist, Soil Conservation Service.

Most of this survey area is rangeland. The area is arid. Precipitation in most years is about 5 inches, but in some parts of the area it is as low as 3 inches. At the higher elevations, however, precipitation is about 20 inches.

Most parts of this survey area considered to be rangeland produce little grazable forage. The amount of forage that is presently produced is less than the amount originally produced or the amount that can potentially be produced. The rangeland is mainly leased as annual range by the Bureau of Land Management. Generally, livestock is allowed on the range only during seasons of favorable moisture, when the annual plants are more abundant.

The native vegetation over most of the survey area has suffered from past overgrazing, especially those areas near sources of water, around old mining camps and settled areas, and near farm of ranch headquarters. Creosotebush and white bursage, probably the most common plants in the area today, have increased along with certain other shrubs and cacti at the expense of the more desirable grasses and palatable shrubs. Plants such as black grama, blue grama, bush muhly, range ratany, and needlegrass have become scarce or even rare in many places because of the overgrazing.

Most of the soils are shallow and have low available water capacity. The soils also are calcareous. Some soils have thick, hard caliche layers that greatly reduce the rooting depth for plants, and others are high in gypsum.

The soils in this survey area that have high content of lime produce mainly a cover of creosotebush and white bursage, but some of the limy soils produce blackbrush. The soils that have a high content of gypsum generally have a sparse plant cover or are nearly barren. Joshua-trees and an understory of creosotebush or blackbrush commonly occur on a few soils. The soils at the higher elevations of the Virgin Mountains and the Mormon Mountains support scattered pinyon pine, Utah juniper, scrub oak, and big sagebrush.

Where climate and topography are about the same, differences in the kind and amount of vegetation that rangeland can produce are related closely to the kind of soil. Effective management is based on the relationships among soils, vegetation, and water.

Table 6 shows, for each kind of soil, the name of the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the expected percentage of each species in the composition of the potential natural plant community. Soils not listed cannot support a natural plant community of predominately grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. The following are explanations of column headings in table 6.

A *range site* is a distinctive kind of rangeland that differs from other kinds of rangeland in its ability to produce a characteristic natural plant community. Soils that produce a similar kind, amount, and proportion of range plants are grouped into range sites. For those areas where the relationship between soils and vegetation has been established, range sites can be interpreted directly from the soil map. Properties that determine the capacity of the soil to supply moisture and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Total production refers to the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year the amount and distribution of precipitation and the temperatures are such that growing conditions are substantially better than average; in a normal year these conditions are about average for the area; in an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight refers to the total air-dry vegetation produced per acre each year by the potential natural plant community. Vegetation that is highly palatable to livestock and vegetation that is unpalatable are included. Some of the vegetation can also be grazed extensively by wildlife.

Characteristic species of grasses, grasslike plants, forbs, and shrubs that make up most of the potential natural plant community on each soil are listed by common name. Under *Composition*, the expected proportion of each species is presented as the percentage, in air-dry weight, of the total annual production of herbaceous and woody plants. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season. Generally all of the vegetation produced is not used.

Range management requires, in addition to knowledge of the kinds of soil and the potential natural plant community, an evaluation of the present condition of the range vegetation in relation to its potential. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the maximum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below

the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

The major management concern on most of the rangeland in the survey area is control of grazing so that the kinds and amounts of plants that make up the potential natural plant community are reestablished. Forage production is less than that originally produced because the natural vegetation in many parts of the area has been depleted by continued overuse.

Management practices that control the duration and season of use and the grazing intensity would permit the reestablishment of the natural vegetation. Deferred grazing, proper grazing use, and in some cases the exclusion of livestock from the more depleted areas would be beneficial to the area. Seeding in these areas is not considered to be feasible at this time.

Engineering

This section provides information about the use of the soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 7 shows, for each kind of soil, the degree and kind of limitations for building site development; table 8, for sanitary facilities; and table 10, for water management. Table 9 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 7. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable

or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness; depth to a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 7 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 7 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 8 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, or *poor*, which, respectively, mean about the same as the terms *slight*, *moderate*, and *severe*.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of I8 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to

minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 8 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 9 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 12 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, low potential frost action, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 9 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals,

reaction, and stratification are given in the soil series descriptions and in table 12.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can limit or prevent plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 10 soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Aquifer-fed excavated ponds are bodies of water made by excavating a pit or dugout into a ground-water aquifer. Excluded are ponds that are fed by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Ratings in table 10 are for ponds that are properly designed, located, and constructed. Soil properties and site features that affect aquifer-fed ponds are depth to a permanent water table, permeability of the aquifer, quality of the water, and ease of excavation.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage. The soil properties and site features that affect drainage have been listed for only those soils that are suitable for cropland.

Irrigation is affected by such features as slope, susceptibility to flooding, hazards of water erosion and soil blowing, texture, presence of salts and alkali, depth of root zone, rate of water intake at the surface, permeability of the soil below the surface layer, available water capacity, need for drainage, and depth to the water table. The soil properties and site features that affect irrigation have been listed for only those soils that are suitable for cropland.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Recreation

Many kinds of recreational facilities are available in the survey area. The nearby Lake Mead Recreation Area, which is administered by the National Park Service, draws visitors from a wide area. Year-round fishing is permitted, and catches generally are good. Besides boating and fishing on the lake, there are bathing areas and picnic grounds at several locations along the lake. The nearest boat dock site is about 12 miles south of Overton, where the water is deep and fluctuations of the lake level are not extreme.

The nearby Valley of Fire State Park also has picnic facilities and contains a display of very colorful and unusual rock formations. Petrified wood and ancient Indian petroglyphs are found within the area.

The Nevada Fish and Game Commission maintains the Overton Wildlife Management Area on the tip of Lake Mead, below the town of Overton. The growing of feed and the ponding of water have provided a resting place for ducks, shore birds, and other game birds in the area. A few hunters are admitted to the project area during the hunting season. Quail and dove hunting generally is good throughout the valley. Deer hunting in the Virgin Mountains generally is poor to fair.

Two private resorts with swimming pools and picnic areas have been established in the upper part of Moapa Valley in the area of the warm springs that supply water to the Muddy River. Washington palm trees, though not native to the area, have become well established in the area of the springs and lend an attractive setting to the resorts.

County-built swimming pools are also available for public use at Moapa High School in Overton and Virgin Valley High School in Mesquite.

The soils of the survey area are rated in table 11 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreational facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 11 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 8, and interpretations for dwellings without basements and for local roads and streets, given in table 7.

Camp areas require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

Wildlife habitat

In the Virgin River Area the availability of water severely limits the population of most wildlife species. The river systems and a few perennial mountain springs provide drinking water for wildlife, and spring areas provide a small amount of forage. Most wildlife species that require significant amounts of riparian vegetation for food and cover obtain it on the flood plains of the Virgin and Muddy Rivers.

Mammals typical of the salt desert shrub community, such as the white-tailed antelope, squirrel, kit fox, black-tailed jackrabbit, and coyote, are common. Cottontail rabbit, mourning dove, and Gambel's quail are the most important upland game species. Pheasant have been released in the past and maintain a small population in the lower part of Moapa Valley.

This survey area is within the Pacific flyway. Migratory waterfowl and shore birds are attracted to nearby Lake Mead, which is a large body of water formed by Boulder Dam. Some of these transient birds use the river flood plains and the adjacent irrigated cropland areas mainly in fall, in winter, and early in spring.

Other birds of interest are the resident roadrunner and several species of hawk that migrate through the area or that winter in it.

Of the species of bird that have been observed in the area, the southern bald eagle and peregrine falcon are

classified as endangered and the prairie falcon is classified as threatened.

The area has a great variety of snakes and lizards. The Great Basin gopher snake, the Mohave Desert sidewinder, and the Great Basin rattlesnake are among the best known species of snake. Two protected reptiles inhabit the area—the Gila monster and the desert tortoise.

One species of fish from the Virgin River, the virgin spinedace (Spinedace Lepidomeda mollispinis), has been classified as threatened.

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populates an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either is scarce or does not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In the section "General soil map for broad land use planning," the map units in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in general planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting general map units that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the general map unit is rated good, fair, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH, or reaction, of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features, engineering test data, and data obtained from physical and chemical laboratory analyses of soils.

Engineering properties

Table 12 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 12 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 12 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified soil classification system (Unified) (*2*) and the system adopted by the

American Association of State Highway and Transportation Officials (AASHTO) (*1*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The estimated classification, without group index numbers, is given in table 12. Also in table 12 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and plasticity index is estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

In this survey, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterburg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 13 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Salinity is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of the nonirrigated soils. The salinity of individual irrigated fields is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of individual fields can differ greatly from the value given in table 13. Salinity affects the suitability of a soil for crop production, its stability when used as a construction material, and its potential to corrode metal and concrete.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the

magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Wind erodibility groups are made up of soils that have similar properties that affect their resistance to soil blowing if cultivated. The groups are used to predict the susceptibility of soil to blowing and the amount of soil lost as a result of blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are extremely erodible, so vegetation is difficult to establish. They are generally not suitable for crops.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible, but crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible, but crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible, but crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible, and crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible, and crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

Soil and water features

Table 14 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 14 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Cemented pans are hard subsurface layers, within a depth of 5 or 6 feet, that are strongly compacted (indurated). Such pans cause difficulty in excavation. The hardness of pans is similar to that of bedrock. A rippable pan can be excavated, but a hard pan generally requires blasting.

Engineering test data

The results of analyses of engineering properties of several typical soils of the survey area are given in table 15.

The data presented are for soil samples that were collected from carefully selected sites. The soil profiles sampled are typical of the series discussed in the section "Soil series and morphology." The soil samples were analyzed by the Nevada Department of Highways in accordance with standard procedures of the American Association of State Highway and Transportation Officials (AASHTO).

The methods used in obtaining the data are listed by code in the next paragraph. Most of the codes, in parentheses, refer to the methods assigned by the American Association of State Highway and Transportation Officials.

The methods and codes are AASHTO classification (M-145-66); Unified classification (D-2487-66T); mechanical analysis (T88-57); liquid limit (T89-60); and plasticity index (T90-56).

Additional data on the soils in the survey area are available in Soil Survey Investigations Report No. 23 (*7*).

Soil series and morphology

In this section, each soil series recognized in the survey area is described in detail. The descriptions are arranged in alphabetic order by series name.

Characteristics of the soil and the material in which it formed are discussed for each series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*5*). Unless otherwise noted, colors described are for dry soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or map units, of each soil series are described in the section "Soil maps for detailed planning."

Anthony series

The Anthony series consists of deep, well drained soils on flood plains, small alluvial fans, and low stream terraces. These soils formed in alluvium weathered from mixed rock, mainly sandstone, limestone, and shale. Slope is 0 to 2 percent.

Typical pedon of Anthony fine sandy loam, 0 to 2 percent slopes, about 2.25 miles northwest of Glendale, near the center of the NE1/4 of sec. 27, T. 14 S., R. 66 E.:

A1—0 to 8 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and medium and common very fine roots; many very fine, common fine, and few medium tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—8 to 60 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; massive, soft, very friable, slightly sticky and slightly plastic; few fine and medium and common very fine roots; few very fine tubular pores; strongly effervescent; moderately alkaline.

The profile has hue dominantly of 7.5YR, but hue ranges from 5YR to 10YR. Value is 6 or 7 when dry, and chroma is 2 to 4 when moist. The part of the profile between depths of 10 and 40 inches is dominantly fine sandy loam, but in some pedons it is sandy loam and has thin strata of very fine sandy loam, silt loam, or loamy fine sand.

Arada series

The Arada series consists of deep, somewhat excessively drained soils on terraces and alluvial fans. These soils formed in sandy, wind-deposited materials that are underlain by older, gravelly and loamy alluvium. Slope is 0 to 8 percent.

Typical pedon of Arada fine sand, 2 to 8 percent slopes, adjacent to Stringtown Road in Moapa Valley, about 1,000 feet south and 350 feet east of the northwest corner of sec. 26, T. 15 S., R. 67 E.:

C1—0 to 6 inches; pink (5YR 7/4) fine sand, yellowish red (5YR 5/6) moist; single grain; loose; common very fine roots; many very fine interstitial pores; violently effervescent; moderately alkaline; clear smooth boundary.

C2—6 to 16 inches; pink (5YR 7/4) fine sand, yellowish red (5YR 5/6) moist; single grain; loose; common very fine and fine roots; many very fine interstitial pores; violently effervescent; strongly alkaline; clear smooth boundary.

C3—16 to 27 inches; pink (7.5YR 7/4) fine sand, brown (7.5YR 5/4) moist; single grain; loose; few very fine and fine roots; many very fine interstitial pores; violently effervescent; few medium faint pink (7.5YR 8/4) lime segregations; strongly alkaline; clear smooth boundary.

IIC4ca—27 to 37 inches; pink (7.5YR 7/4) gravelly loamy fine sand, brown (7.5YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine tubular and many very fine interstitial pores; violently effervescent; common fine faint pink (7.5YR 8/4) lime segregations and coatings on pebbles; strongly alkaline; abrupt wavy boundary.

IIC5ca—37 to 43 inches; pinkish white (7.5YR 8/2) very gravelly sandy loam that is weakly cemented with lime, light brown (7.5YR 6/4) moist; massive; very hard and hard, firm, nonsticky and nonplastic; few very fine roots; few very fine horizontal tubular and common very fine interstitial pores; violently effervescent; strongly alkaline; abrupt wavy boundary.

IIC6ca—43 to 60 inches; very pale brown (10YR 8/3) very gravelly loamy coarse sand, very pale brown (10YR 7/3) moist; massive; hard, friable, nonsticky and nonplastic; few very fine roots; many very fine and fine interstitial pores; violently effervescent; strongly alkaline.

The IIC horizon is at a depth of 20 to 38 inches, and the IICca horizon is at a depth of 24 to 39 inches. The C horizon has hue of 5YR or 7.5YR, value of 6 or 7 when dry and 5 or 6 when moist, and chroma of 4 to 6. It is dominantly fine sand, but in some pedons it has strata of sand or loamy fine sand. The IIC horizon has hue of 10YR or 7.5YR, value of 6 to 8 when dry and 5 to 7 when moist, and chroma of 1 to 4. Chroma of 1 occurs only in horizons of lime concentration. The IIC horizon is dominantly fine sandy loam, sandy loam, or coarse sandy loam and is as much as 80 percent gravel in any one stratum. The IICca horizon has 25 percent to more than 40 percent calcium carbonate equivalent. It is weakly cemented to strongly cemented below a depth of 30 to 58 inches. In some pedons it is indurated at a depth of more than 40 inches.

Arada Variant

The Arada Variant consists of moderately deep, somewhat excessively drained soils on terraces above the flood plains and below mesa escarpments. These soils formed in wind deposited material derived mainly from sandstone. They have an indurated or strongly cemented hardpan. Slope is 2 to 8 percent.

Typical pedon of Arada fine sand, hardpan variant, 2 to 8 percent slopes, along the west side of the Virgin River, about 1,000 feet southwest of the northeast corner of sec. 25, T. 15 S., R. 68 E.:

C1—0 to 6 inches; pink (5YR 7/4) fine sand, yellowish red (5YR 5/6) moist; single grain; loose; common very fine roots; many very fine interstitial pores; violently effervescent; moderately alkaline; clear smooth boundary.

C2—6 to 16 inches; pink (5YR 7/4) fine sand, yellowish red (5YR 5/6) moist; single grain; loose; common very fine and fine roots; many very fine interstitial pores; violently effervescent; strongly alkaline; clear smooth boundary.

C3—16 to 30 inches; pink (7.5YR 7/4) fine sand, brown (7.5YR 5/4) moist; single grain; loose; few very fine and fine roots; many very fine interstitial pores; violently effervescent; few medium faint pink (7.5YR 8/4) lime segregations; strongly alkaline; abrupt wavy boundary.

C4cam—30 to 35 inches; pinkish white (7.5YR 8/2) indurated lime cemented gravelly material, light brown (7.5YR 6/4) moist; massive; extremely hard; extremely firm; no roots except as a mat on the horizon surface; violently effervescent; strongly alkaline.

The lime-indurated hardpan is at a depth of 24 to 36 inches. The C horizon has hue of 5YR or 7.5YR, value of 6 or 7 when dry and 5 or 6 when moist, and chroma of 4 to 6. It is mainly fine sand, but in some pedons it has strata of sand or loamy fine sand. The profile is calcareous throughout.

Arizo series

The Arizo series consists of deep, excessively drained soils on flood plains and recent alluvial fans. These soils formed in very gravelly sandy alluvium derived from granite, gneiss, limestone, sandstone, and shale an in older valley-fill material. Slope is 0 to 15 percent.

Typical pedon of Arizo fine sand, about 1,000 feet east and 600 feet south of the center of sec. 20, T. 13 S., R. 71 E.:

A1—0 to 8 inches; light brownish gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; weak thick platy structure; slightly hard, very friable; few fine and medium roots; few fine vesicular pores and many very fine and fine interstitial pores; strongly effervescent; moderately alkaline; abrupt wavy boundary.

C1—8 to 36 inches; light brownish gray (10YR 6/2) very gravelly sand, dark grayish brown (10YR 4/2) moist; single grain; loose; few fine and medium roots; many very fine and fine interstitial pores; strongly effervescent; few pebbles have very thin coats of lime on part of the underside; moderately alkaline; gradual wavy boundary.

C2—36 to 60 inches; light brownish gray (10YR 6/2) very gravelly and very cobbly sand, dark grayish brown (10YR 4/2) moist; single grain; loose; few very fine and fine roots; many very fine and fine and few medium interstitial pores; strongly effervescent; moderately alkaline.

The profile has hue of 10YR or 7.5YR, value of 5 to 7 when dry and 4 to 6 when moist, and chroma of 2 to 4. In some pedons the A1 horizon is at least 1/2 unit of value darker than the rest of the profile. The content of lime varies from one stratum to another, but some part of the profile between depths of 10 and 40 inches is effervescent. The texture is mainly sand, coarse sand, or loamy coarse sand, but some pedons are loamy sand. Content of rock fragments ranges from 35 to 80 percent. Content of gravel ranges from 35 to 75 percent, content of cobbles is as much as 25 percent, and content of stones is as much as 10 percent.

Arrolime series

The Arrolime series consists of deep, well drained soils on strongly dissected old alluvial fans that have smooth to slightly convex side slopes. These soils formed in highly gypsiferous alluvium derived mainly from gypsum with some admixture from limestone, sandstone, and other sedimentary rock. Slope is 2 to 15 percent.

Typical pedon of Arrolime gravelly silt loam, 2 to 15 percent slopes, about 700 feet north and 1,500 feet east of the southwest corner of sec. 13, T. 16 S., R. 66 E.:

A1—0 to 2 inches; pink (7.5YR 7/4) gravelly silt loam, brown (7.5YR 4/4) moist; weak thick platy structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; many fine and very fine vesicular pores; violently effervescent; very strongly alkaline; abrupt smooth boundary.

C1—2 to 5 inches; reddish yellow (5YR 6/6) silty clay loam, yellowish red (5YR 4/6) moist; strong medium platy structure; slightly hard, very friable, sticky and plastic; few very fine and fine roots; few very fine tubular and common very fine and fine interstitial pores; very few thin reddish brown (5YR 5/4) clay films on pebbles and few colloids in bridges between sand grains; 10 percent gravel; violently effervescent; strongly alkaline; abrupt wavy boundary.

C2csca—5 to 15 inches; pink (7.5YR 7/4) gravelly silt loam; yellowish brown (5YR 5/6) moist; many coarse prominent pinkish white (5YR 8/2) gypsum and lime mottles and soft nodules; moderate very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and few fine and medium roots; many very fine interstitial pores; 30 percent gravel; violently effervescent; moderately alkaline; clear wavy boundary.

IIC3csca—15 to 36 inches; pink (5YR 7/4) very gravelly silt loam; yellowish red (5YR 5/6) moist; many coarse prominent pinkish white (5YR 8/2) gypsum and lime mottles and soft nodules; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular and interstitial

pores; 70 percent gravel; violently effervescent; moderately alkaline; gradual wavy boundary.

IIC4—36 to 49 inches; light reddish brown (5YR 6/4) very gravelly clay loam; yellowish red (5YR 4/6) and dark reddish brown (5YR 3/4) moist; few coarse distinct reddish brown (5YR 4/4) mottles; massive; very hard, friable, sticky and plastic; few very fine tubular and many very fine interstitial pores; 70 percent gravel; violently effervescent; strongly alkaline; abrupt smooth boundary.

IIIC5cs—49 to 62 inches; mixed red (2.5YR 5/6) and light reddish brown (5YR 6/4) light silty clay loam; red (2.5YR 4/6) moist; common fine medium and coarse distinct pink (5YR 8/4 and 7.5YR 8/4) soft gypsum nodules and mottles; massive; very hard, friable, sticky and plastic; many very fine interstitial pores; 10 percent gravel and 60 percent gypsum; violently effervescent; mildly alkaline.

The profile, except for the Cca horizon, has hue of 5YR or 7.5YR, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 4 to 6. The 10- to 40-inch control section is silt loam, silty clay loam, and clay loam and has 50 to 80 percent gravel. The gravel is less than 2 inches in diameter, averaging about 3/4 inch. It is rounded and subrounded. Lime mottles, stains, and soft nodules can occur in any horizon below the A1 horizon. The Ccs horizon has hue of 2.5YR to 10YR, value of 5 to 8 when dry and 4 to 6 when moist, and chroma of 1 to 6. It is at a depth of 3 to 10 inches and is 24 to 40 inches thick. The gypsum is disseminated or segregated and is in the form of very fine crystals or coarse soft nodules.

Bard series

The Bard series consists of shallow, well drained soils on old terraces and alluvial fans. These soils formed in loamy alluvium derived mainly from limestone and a small amount of sandstone and quartzite. Slope is 2 to 15 percent.

Typical pedon of Bard gravelly fine sandy loam, about 2,000 feet south and 2,640 feet east of the northwest corner of sec. 24, T. 14 S., R. 65 E.:

A1—0 to 1 inch; very pale brown (10YR 8/3) gravelly fine sandy loam, brown (10YR 5/3) moist; moderate thick platy structure; slightly hard, friable, nonsticky and nonplastic; many very fine and fine and common medium vesicular pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

C1—1 to 5 inches; pink (7.5YR 7/4) loam, brown (7.5YR 5/4) moist; moderate thin to thick platy structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine and fine interstitial and few very fine tubular pores; violently effervescent; moderately alkaline; abrupt wavy boundary.

C2—5 to 11 inches; pink (7.5YR 7/4) fine sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; few very fine and medium roots; common very fine and few fine interstitial pores; violently effervescent; few to common fine and medium white (10YR 8/2) soft lime segregations; moderately alkaline; clear wavy boundary.

C3ca—11 to 19 inches; pink (7.5YR 8/4) fine sandy loam, pink (7.5YR 7/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; few very fine and fine roots; many fine and very fine interstitial pores; violently effervescent; many hard to extremely hard white (10YR 8/2) lime nodules as much as 1 1/2 inches in diameter; very strongly alkaline; abrupt wavy boundary.

C4cam—19 to 36 inches; pinkish white (7.5YR 8/2) indurated lime hardpan containing many very thin laminae in the upper 1/2 inch, pink (7.5YR 7/4) moist; massive; extremely hard, extremely firm; violently effervescent; moderately alkaline.

The surface is a weakly developed gravel pavement consisting of limestone and hardpan fragments. The gravel pavement is weakly to strongly developed and covers 15 to 90 percent of the surface. Depth to the indurated-lime hardpan is 14 to 20 inches. The profile has hue of 5YR, 7.5YR, or 10YR; value of 6 to 8 when dry and 5 to 7 when moist; and chroma of 1 to 6. Value of 8 when dry and 7 when moist and chroma of 1 occur only in the Cca horizon. Hue of 5YR and chroma of 5 or 6 occur immediately below the A1 horizon in those profiles that have a strongly developed gravel pavement. Texture between depths of 10 and 20 inches is fine sandy loam, sandy loam, or loam. The Cca horizon is at a depth of 7 to 14 inches. The upper part is as much as 75 percent soft masses to extremely hard lime nodules. The lime-indurated hardpan is more than 12 inches thick. It ranges from gravel-free to very gravelly.

Bitter Spring series

The Bitter Spring series consists of deep, well drained soils on smooth, slightly convex alluvial fans. These soils formed in alluvium derived from a wide variety of igneous, sedimentary, and metamorphic rocks, including schist, granite, quartzite, gneiss, andesite, and limestone. Slope is dominantly 1 to 5 percent, but it is as much as 8 percent.

Typical pedon of a Bitter Spring very gravelly loam in an area of Bitter Spring-Arizo association, moderately sloping, about 350 feet northwest of Bunkerville Park, about 1,200 feet east and 900 feet north of the southwest corner of sec. 35, T. 13 S., R. 70 E.:

A1—0 to 2 inches; pink (7.5YR 7/4) very gravelly loam, dark brown (7.5YR 4/4) moist; moderate thick platy structure; hard, friable, slightly sticky and plastic;

very few fine roots; many fine and medium vesicular and few very fine tubular pores; thin continuous clay films in pores; many bleached sand grains; 40 percent gravel; violently effervescent; strongly alkaline; abrupt smooth boundary.

B2t—2 to 5 inches; light reddish brown (5YR 6/4) light sandy clay loam, reddish brown (5YR 4/4) moist; moderate fine and medium subangular blocky structure and weak thin and medium platy; hard, friable, sticky and plastic; few fine roots; common fine and medium vesicular and tubular pores; thin continuous clay films on ped surfaces and in pores; violently effervescent; strongly alkaline; abrupt wavy boundary.

B3tca—5 to 7 inches; light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine tubular pores; 10 percent gravel; violently effervescent; moderately alkaline; abrupt wavy boundary.

C1ca—7 to 14 inches; pink (7.5YR 7/4) very gravelly sandy loam, brown (7.5YR 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; 35 percent lime-coated gravel; violently effervescent; moderately alkaline; clear wavy boundary.

IIC2—14 to 50 inches; light reddish brown (5YR 6/4) very gravelly sandy loam, reddish brown (5YR 4/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; 85 percent gravel; some pebbles have thin lime coatings on bottoms; few fine and medium distinct pinkish white (5YR 8/2) lime veins; violently effervescent; moderately alkaline.

The solum is 5 to 10 inches thick. The control section, from the top of the argillic horizon to a depth of 40 inches, has an average texture of very gravelly sandy loam. It is 10 to 18 percent clay and more than 35 percent gravel. The A1 horizon has hue of 7.5YR or 5YR, value of 6 or 7 when dry and 4 or 5 when moist, and chroma of 2 to 4. The B2t horizon has hue of 5YR or 7.5YR, value of 5 or 6 when dry and 4 to 5 when moist, and chroma of 4 to 6. It is light sandy clay loam, sandy loam, or fine sandy loam and is as much as 30 percent gravel. The argillic horizon has an average clay content of 10 to 18 percent. The C1ca horizon is not present in some pedons. Fine salt and gypsum segregations occur in the B3ca, C1ca, or C1 horizon in some pedons. Depth to very gravelly material containing 50 to 90 percent gravel is 7 to 20 inches.

Black Butte series

The Black Butte series consists of deep, well drained soils on smooth alluvial fans and flood plains. These soils formed in material derived mainly from limestone, sandstone, shale, and older valley-fill material. Slope is mainly 0.2 to 0.7 percent but is as much as 2 percent.

Typical pedon of Black Butte silt loam, about 1 1/2 miles west of Mesquite, Nevada; about 1,170 feet north and 440 feet east of the south quarter corner of sec. 17, T. 13 S., R. 71 E.:

Ap—0 to 6 inches; light reddish brown (5YR 6/3) silt loam, reddish brown (5YR 4/3) moist; weak medium and fine granular structure; hard, friable, sticky and plastic; many fine roots; many fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—6 to 16 inches; light reddish brown (5YR 6/3) silty clay loam, reddish brown (5YR 4/3) moist; fine subangular blocky structure; hard, friable, sticky and plastic; many fine roots; many fine tubular pores; few medium wormholes and many worm casts; few fine white (10YR 8/2) gypsum filaments; strongly effervescent; moderately alkaline; clear irregular boundary.

C2—16 to 20 inches; mixed light reddish brown (5YR 6/3 and 6/4) sandy clay loam, reddish brown (5YR 4/3 and 5/4) moist; weak fine subangular blocky structure; hard, friable, sticky and plastic; many fine roots; many fine tubular pores; strongly effervescent; moderately alkaline; clear wavy boundary.

IIC3—20 to 60 inches; light reddish brown (5YR 6/4) fine sand, reddish brown (5YR 5/4) moist; single grain; loose; common fine roots; many very fine interstitial pores; slightly effervescent; moderately alkaline.

The underlying sandy material commonly is at a depth of 16 to 22 inches, but it ranges from 14 to 36 inches in depth. The profile has hue of 5YR or 7.5YR, value of 5 to 7 when dry and 4 to 5 when moist, and chroma of 3 or 4. The sandy material has dry value of 7. The upper part of the control section is dominantly silty clay loam or silt loam. It is more than 15 percent sand that is coarser than very fine sand and 20 to 30 percent clay. Strata of loam, sandy clay loam, or fine sandy loam occur in the transitional zone to the underlying sandy material. The unconformable sandy material is dominantly fine sand, but in some pedons it includes thin strata of loamy fine sand, silt loam, or very fine sandy loam. The content of lime varies from stratum to stratum. The lime commonly is disseminated.

Bluepoint series

The Bluepoint series consists of deep, somewhat excessively drained soils in smooth, slightly convex areas on alluvial fans, flood plains, and terraces. These soils formed in very deep, sandy alluvium derived from sandstone; reworked, unconsolidated, Tertiary basin-fill material; rhyolite; andesite; monzonite; and limestone. Slope is 0 to 2 percent.

Typical pedon of Bluepoint loamy fine sand, about 2 miles south of Overton, Nevada; about 330 feet east and 250 feet north of the west quarter corner of sec. 29, T. 16 S., R. 68 E.:

Ap—0 to 9 inches; light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 5/4) moist; massive; soft and slightly hard, very friable; many fine and medium roots; many very fine interstitial pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

C1—9 to 17 inches; light reddish brown (5YR 6/4) finely stratified light loamy fine sand and heavy loamy fine sand, reddish brown (5YR 5/4) moist; weak thick platy structure because of stratification; soft and slightly hard, very friable; many fine and medium roots; few very fine and fine tubular and many very fine interstitial pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

C2—17 to 30 inches; pink (5YR 7/4) fine sand, reddish brown (5YR 5/4) moist; single grain; loose; many fine and common medium roots; many very fine interstitial pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

C3—30 to 41 inches; pink (5YR 7/4) loamy fine sand, reddish brown (5YR 5/4) moist; massive; slightly hard, very friable; common fine and medium roots; many very fine interstitial pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

C4—41 to 56 inches; pink (5YR 7/4) light very fine sandy loam, reddish brown (5YR 5/4) moist; weak medium and thick platy structure because of stratification; slightly hard, very friable, nonsticky and nonplastic; common fine roots; many very fine tubular pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

C5—56 to 80 inches; pink (5YR 7/4) loamy fine sand, reddish brown (5YR 5/4) moist; massive; slightly hard, very friable; many fine roots; many very fine interstitial pores; violently effervescent; strongly alkaline.

The profile has hue of 5YR, 7.5YR, or 10YR; value of 5 to 7 when dry and 4 or 5 when moist; and chroma of 3 to 6. The control section is dominantly loamy fine sand or loamy sand, but in some pedons it is sand or fine sand that has more than 10 percent silt and clay. It averages less than 15 percent rock fragments, but in some pedons it is as much as 30 percent fine gravel. The profile commonly is calcareous throughout and contains less than 15 percent calcium carbonate equivalent. Few or common, very fine to medium gypsum or lime segregations are present below a depth of 20 inches in some pedons.

Calico series

The Calico series consists of deep, somewhat poorly drained soils on smooth flood plains. These soils formed in loamy alluvium deposited by floodwater over clayey alluvium. The loamy alluvium was derived from mixed rock sources, including assorted volcanic and sedimentary rocks. Slope commonly is less than 1 percent, but it is as much as 2 percent.

Typical pedon of Calico fine sandy loam, in Moapa Valley, about 1,500 feet west and 660 feet south of the northeast corner of sec. 2, T. 17 S., R. 67 E.:

Ap—0 to 6 inches; very pale brown (10YR 7/3) fine sandy loam, brown (7.5YR 4/2) moist; weak very thick platy structure that parts to weak medium and fine granular; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine interstitial pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—6 to 15 inches; very pale brown (10YR 7/3) fine sandy loam, brown (7.5YR 5/4) moist; weak thin platy structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and common fine roots; many very fine and fine tubular pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C2—15 to 22 inches; very pale brown (10YR 7/3) finely stratified silt loam and fine sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, friable and very friable, nonsticky and nonplastic; common very fine roots; common very fine and fine tubular pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

IIC3—22 to 31 inches; light brownish gray (10YR 6/2) stratified silty clay and silty clay loam, very dark grayish brown and dark grayish brown (10YR 3/2 and 4/2) moist; common fine distinct reddish brown (5YR 5/4) clay lumps; few fine prominent dark reddish brown (5YR 3/4) iron mottles; common fine to coarse faint very dark gray (10YR 3/1) organic stains; moderate medium subangular blocky structure; hard and slightly hard, firm and friable, very sticky and sticky and very plastic and plastic; common very fine roots; common very fine and fine tubular pores; violently effervescent; moderately alkaline; clear wavy boundary.

IIC4—31 to 37 inches; finely stratified grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) silty clay, very dark brown (10YR 2/2) and very dark grayish brown (10YR 3/2) moist; common fine prominent yellowish red (5YR 5/6) and olive gray (5Y 5/2) iron mottles, and many fine faint very dark gray (N 3/) organic stains; moderate medium subangular blocky structure; hard and slightly hard, friable, very sticky and very plastic; few very fine roots; common very fine and few fine tubular pores; vio-

lently effervescent; moderately alkaline; clear wavy boundary.

IIIC5g—37 to 43 inches; light gray (5Y 7/1) finely stratified fine sandy loam, clay loam, and silt loam, gray (5Y 5/1) moist; many fine distinct white (10YR 8/1) gypsum flecks; weak medium and fine granular structure; very hard and slightly hard, firm and friable, nonsticky and very sticky and nonplastic and very plastic; few very fine roots; many very fine and few fine interstitial pores; strongly effervescent; moderately alkaline; abrupt wavy boundary.

IVC6—43 to 60 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; single grain; loose; few very fine roots; many very fine interstitial pores; strongly effervescent; moderately alkaline.

The unconformable, fine-textured stratum is at a depth of 20 to 30 inches. It is 14 to 30 inches thick. Iron mottles that have hue of 2.5YR to 5BG and chroma of 2 or more are common below a depth of 20 inches. The upper part of the control section is dominantly fine sandy loam and has a weighted average clay content of less than 18 percent. Strata of very fine sandy loam, silt loam, loam, sandy loam, or clay loam as much as 3 inches thick are in some pedons. The upper part of the control section has hue of 10YR or 7.5YR, value of 6 or 7 when dry and 4 or 5 when moist, and chroma of 2 to 4. The lower part is dominantly silty clay or clay and has strata of clay loam, silty clay loam, or heavy silt loam in some pedons. It has hue of 10YR to 5Y, value of 4 to 7 when dry and 2 to 5 when moist, and chroma of 1 to 3. A few very hard lime nodules less than 1/2 inch in diameter are below a depth of 40 inches in some pedons. Salt and gypsum crystals are above the water table in some pedons.

Calico Variant

The Calico Variant consists of deep, somewhat poorly drained soils on smooth flood plains. These soils formed in alluvium derived mainly from limestone with an admixture of sandstone, basalt, and other rock material. Slope commonly is less than 1 percent, but it ranges from 0 to 2 percent.

Typical pedon of Calico loamy fine sand, coarse variant, drained, about 1,320 feet south and 660 feet east of the northwest corner of sec. 17, T. 15 S., R. 67 E.:

A1—0 to 9 inches; light brownish gray (10YR 6/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; single grain; loose; many very fine and fine roots; many very fine and fine interstitial pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—9 to 27 inches; light brownish gray (10YR 6/2) stratified loamy fine sand and fine sandy loam, dark grayish brown (10YR 4/2) moist; weak thin platy structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine interstitial pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

IIC2—27 to 60 inches; strongly mottled, gray (10YR 5/1) and reddish brown (5YR 5/3) stratified silty clay and silty clay loam, dark grayish brown (10YR 4/2) and reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, very sticky and very plastic; few very fine roots; many very fine and few fine interstitial pores; moderately alkaline.

The C1 horizon is mainly loamy fine sand, but it has thin strata of fine sandy loam. Fine salt and gypsum segregations occur throughout the profile and commonly increase with depth.

Cave series

The Cave series consists of shallow and very shallow, well drained soils on alluvial fans and terraces. These soils formed in alluvium derived from limestone and an admixture of sandstone, shale, quartzite, and rhyolite. Slope is 2 to 15 percent.

Typical pedon of Cave gravelly loam in an area of Nickel-Arizo association, rolling, about 5 1/2 miles south of Mesquite, Nevada; about 1,760 feet north and 300 feet west of the southeast corner of sec. 9, T. 14 S., R. 71 E.:

A1—0 to 4 inches; pink (7.5YR 7/4) gravelly loam, light brown (7.5YR 6/4) moist; weak thin and medium platy structure; hard, friable, slightly plastic; few fine roots; few very fine and fine vesicular pores and many very fine and common fine tubular pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C1—4 to 15 inches; reddish yellow (7.5YR 6/6) gravelly sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; few very fine tubular pores; violently effervescent; moderately alkaline; abrupt wavy boundary.

C2cam—15 to 35 inches; pinkish white (7.5YR 8/2) indurated hardpan; pinkish gray (7.5YR 7/2) moist; massive; extremely hard, extremely firm; violently effervescent; moderately alkaline.

The lime-cemented pan is at a depth of 4 to 20 inches. The A horizon has hue of 10YR or 7.5YR, value of 5 to 7 when dry and 3 or 4 when moist, and chroma of 3 or 4. The indurated pan is gravelly or very gravelly and cobbly. Some pedons have several indurated, lime-cemented pans separated by strata of friable soil material.

Colorock series

The Colorock series consists of shallow, well drained soils on smooth, slightly convex, broad alluvial fans. The fans are dissected by a few intermittent stream channels. These soils formed in gravelly alluvium derived from mixed rock sources, dominantly limestone but including quartzite and sandstone. Slope commonly is 2 to 5 percent, but it is as much as 8 percent.

Typical pedon of a Colorock very gravelly loam in an area of Colorock-Tonopah association, moderately sloping; about 3 miles west of Dry Lake Station, 1 mile north and 1,320 feet west of the apparent northeast corner of sec. 3, T. 17 S., R. 63 E.:

B1t—0 to 1 inch; pink (7.5YR 7/4) very gravelly loam, brown (7.5YR 5/4) moist; moderate medium prismatic structure; slightly hard, friable, sticky and plastic; few very fine roots; many very fine, common medium, and few fine vesicular pores; few thin clay films on faces of peds; strongly effervescent; moderately alkaline; abrupt slightly wavy boundary.

B2t—1 to 3 inches; pink (7.5YR 7/4) clay loam, light reddish brown (5YR 6/4) moist; weak medium prismatic structure parting to weak thin and medium platy; slightly hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores and many very fine interstitial pores; many thin yellowish red (5YR 5/6) clay films on faces of peds; violently effervescent; moderately alkaline; abrupt wavy boundary.

B3tca—3 to 6 inches; pink (7.5YR 7/4) sandy loam, brown (7.5YR 5/4) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots and few fine roots; few very fine tubular pores and common very fine interstitial pores; few thin clay bridges between sand grains, and many thin clay films in pores; many medium and coarse pinkish white (7.5YR 8/2) lime masses; violently effervescent; strongly alkaline; clear wavy boundary.

IIC1ca—6 to 15 inches; white (10YR 8/2) very gravelly sandy loam, very pale brown (10YR 7/3) moist; massive; hard and very hard, firm and very firm, nonsticky and nonplastic; common very fine roots and many fine and medium roots; common fine and very fine pores and few medium interstitial pores; pockets and seams are weakly cemented with lime; 80 percent gravel; violently effervescent; moderately alkaline; diffuse smooth boundary.

IIC3cam—29 to 42 inches; white (10YR 8/2) lime hardpan that has many thin continuous indurated laminar strata (1/16 to 1/4 inch thick) interbedded with strongly lime cemented strata, very pale brown (10YR 7/3) moist; massive; extremely hard, extremely firm; few very fine interstitial pores; 80 percent gravel; violently effervescent; moderately alkaline; abrupt wavy boundary.

IIC4—42 to 60 inches; light gray (10YR 7/2) very gravelly sandy loam, pale brown (10YR 6/3) moist; massive; hard, friable, nonsticky and nonplastic; many very fine interstitial pores; 80 percent gravel that is lime coated on underside; violently effervescent; moderately alkaline.

The solum is 5 to 10 inches thick. The hardpan is at a depth of 12 to 20 inches. The part of the profile between the top of the argillic horizon and the petrocalcic horizon averages very gravelly sandy loam that is 15 to 20 percent clay and 35 to 60 percent gravel. The rock fragments in the erosion pavement range from subangular to well rounded and are 1/8 inch to 4 inches in diameter. A thin pinkish gray or light brown A1 horizon 1/4 inch to 2 inches thick underlies the erosion pavement in some pedons in protected areas around the base of shrubs and on the lee side of the larger pebbles.

The B1t and B2t horizons have hue of 5YR or 7.5YR, value of 7 when dry and 5 or 6 when moist, and chroma of 4 to 6. These horizons commonly are clay loam, but they are sandy clay loam or heavy loam in some pedons. Strata of secondary lime accumulation occur in the B3 or C1 horizon in some pedons. Secondary lime occurs as white or pinkish white, medium and coarse mottles or as soft nodules. These horizons have value of 8 when dry and 7 when moist. The pebbles in these horizons are coated with lime on all sides. Salt crystals are present in some pedons. Some pedons have thin layers containing 75 to 85 percent gravel in the B3t and C1 horizons.

The Ccam horizon has hue of 10YR or 7.5YR and chroma of 1 to 3. It is 20 to 36 inches thick.

Crystal Springs series

The Crystal Springs series consists of shallow, well drained soils on old dissected alluvial fans and terraces. These soils formed in gravelly loamy alluvium derived mostly from limestone or dolomite and small amounts of quartzite, sandstone, ignimbrite, and schist. Slope is 2 to 4 percent.

Typical pedon of Crystal Springs gravelly sandy loam, 2 to 4 percent slopes, about 300 feet west and 1,000 feet south of the northeast corner of sec. 27, T. 12 S., R. 68 E.:

A1—0 to 1 inch; pale brown (10YR 6/3) gravelly sandy loam, (10YR 4/3) moist; moderate thick platy structure; slightly hard, friable, nonsticky and nonplastic; many very fine and fine and common medium vesicular pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

C1—1 to 11 inches; pale brown (10YR 6/3) gravelly fine sandy loam, brown (10YR 4/3) moist; weak medium and fine subangular blocky structure; slightly hard,

friable; many fine roots; many very fine and fine tubular and irregular pores; violently effervescent; strongly alkaline; clear wavy boundary.

C2cam—11 to 22 inches; white (10YR 8/2) lime-cemented gravelly and cobbly loam, brown (10YR 5/3) moist; massive; very hard, very firm, slightly sticky and slightly plastic; few fine roots; few fine tubular pores; many very fine and fine irregular pores; violently effervescent; strongly alkaline; clear wavy boundary.

Ccam—22 to 42 inches; white (10YR 8/2) indurated gravelly and cobbly hardpan, pale brown (10YR 6/3) moist; extremely hard, extremely firm; very few very fine and fine pores; many very thin dense laminae in the upper 1 to 4 inches; violently effervescent; strongly alkaline.

The petrocalcic, or Ccam, horizon ranges from 11 to 20 inches. The profile has hue of 10YR or 7.5YR. The A1 and C1 horizons have value of 6 to 8 when dry and 4 to 6 when moist, and they have chroma of 2 to 4. The Cca and Ccam horizons have value of 7 or 8 when dry and 6 or 7 when moist, and they have chroma of 1 or 2. The control section is mainly fine sandy loam that is less than 18 percent clay, but in some pedons it is sandy loam. These textures are modified by gravel. A noncemented to strongly cemented Cca horizon is above the Ccam horizon. It ranges from slightly hard to very hard when dry and from friable to firm. The indurated Ccam horizon is 18 to 42 inches thick.

Eastland series

The Eastland series consists of deep, well drained soils on alluvial fans and terraces. These soils formed in mixed alluvium derived dominantly from limestone, basalt, rhyolite, and quartzite. Slope is 0 to 4 percent.

Typical pedon of Eastland gravelly sandy loam, about 500 feet south and 300 feet east of the northwest corner of sec. 17, T. 13 S., R. 70 E.:

C1—0 to 17 inches; light brown (7.5YR 6/4) gravelly sandy loam, brown (7.5YR 4/4) moist; massive; soft, very friable; few very fine and fine roots; many very fine and fine tubular pores; the surface 1 inch contains many fine and common medium vesicular pores and is somewhat finer textured; 35 percent gravel; violently effervescent; moderately alkaline; abrupt smooth boundary.

IIC2—17 to 26 inches; light brown (7.5YR 6/4) very gravelly sand, brown (7.5YR 4/4) moist; massive; slightly hard, very friable; few very fine roots; many very fine and fine interstitial pores; 80 percent gravel; violently effervescent; moderately alkaline; clear wavy boundary.

IIIC3—26 to 38 inches; light brown (7.5YR 6/4) loamy sand, brown (7.5YR 4/4) moist; massive; slightly hard, very friable; few very fine roots; few very fine and fine tubular pores; 10 percent gravel; violently effervescent; moderately alkaline; clear wavy boundary.

IVC4ca—38 to 52 inches; pink (7.5YR 8/4) sandy loam, light brown (7.5YR 6/4) moist; massive; very hard, friable, slightly sticky and slightly plastic; weakly lime cemented; few very fine tubular pores; violently effervescent; strongly alkaline; clear wavy boundary.

VC5ca—52 to 60 inches; pink (7.5YR 8/4) gravelly loamy sand, light brown (7.5YR 6/4) moist; massive; slightly hard, very friable; very weakly lime cemented; many very fine and fine interstitial pores; violently effervescent; moderately alkaline.

The calcic horizon is at a depth of 30 to 40 inches and is 18 to 36 inches thick. It has hue of 7.5YR or 10YR, value of 6 to 8 when dry and 4 to 6 when moist, and chroma of 1 to 4. Value of 8 when dry and 6 when moist and chroma of 1 are only in the Cca horizon. Texture throughout the solum is stratified gravelly loamy sand, loamy sand, very gravelly sand, or gravelly sandy loam. The fine earth fraction of the control section averages loamy sand. The coarse fraction in any one stratum of the control section ranges from 10 to 80 percent and is dominantly gravel. Some pedons are as much as 10 percent cobbles. The content of rock fragments averages 35 to 50 percent. The degree of lime cementation generally is weak, but thin, discontinuous, strongly cemented lenses 1/2 inch to 4 inches thick are in some pedons. The strongly cemented lenses are extremely hard and are firm or very firm. The calcic horizon is hard or very hard and friable or firm.

Flattop series

The Flattop series consists of moderately deep, well drained soils on alluvial fans. These soils formed in alluvium derived from mixed sedimentary and metamorphic rocks. Slope is 2 to 8 percent.

Typical pedon of Flattop gravelly clay loam, 2 to 8 percent slopes, about 2.3 miles north of U.S. Highway 91 and 600 feet east of Elgin Road, about 700 feet west and 600 feet south of the northeast corner of sec. 22, T. 13 S., R. 68 E.:

B21t—0 to 2 inches; light brown (7.5YR 6/4) gravelly clay loam, brown (7.5YR 4/4) moist; moderate medium prismatic structure; very hard, friable, sticky and plastic; few very fine and fine roots; many very fine and fine vesicular pores; many thin clay films in pores and few thin clay films on faces of peds; violently effervescent; very strongly alkaline; abrupt smooth boundary.

B22t—2 to 5 inches; variegated reddish brown (5YR 5/4 and 4/4) light clay loam, reddish brown (5YR 4/4) moist; moderate medium prismatic structure parting

to moderate thin platy; slightly hard, friable, sticky and plastic; common very fine and few fine roots; many very fine interstitial pores and common very fine tubular pores; many thin clay films in pores; and few moderately thick and thin clay films on faces of peds; violently effervescent; moderately alkaline; abrupt irregular boundary.

IIB31tca—5 to 10 inches; yellowish red (5YR 5/6) gravelly fine sandy loam, yellowish red (5YR 4/6) moist; massive; soft, very friable, nonsticky and slightly plastic; common very fine and few fine roots; many very fine and fine interstitial pores; few very thin clay bridges between sand grains and coating sand grains; common fine and medium distinct pinkish white (7.5YR 8/2) lime and gypsum masses; violently effervescent; strongly alkaline; clear smooth boundary.

IIIB32tca—10 to 22 inches; yellowish red (5YR 5/6) very gravelly fine sandy loam, yellowish red (5YR 4/6) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine and fine interstitial pores; few very thin clay bridges between sand grains and coating sand grains; common medium distinct pinkish white (7.5YR 8/2) lime and gypsum segregations and lime coatings on pebbles; violently effervescent; moderately alkaline; gradual smooth boundary.

IIIC1ca—22 to 30 inches; light brown (7.5YR 6/4) very gravelly loamy fine sand, brown (7.5YR 4/4) moist; single grain; loose; few very fine roots; many fine and medium interstitial pores; pinkish white (7.5YR 8/2) coatings on the underside of pebbles; violently effervescent; moderately alkaline; gradual wavy boundary.

IIIC2ca—30 to 60 inches; stratified, in 1- to 9-inch bands, light reddish brown (5YR 6/4) very gravelly fine sand and pinkish white (7.5YR 8/2) strongly lime cemented very gravelly material, reddish brown (5YR 5/4) and pinkish gray (7.5YR 6/2) moist; massive; uncemented material is loose and soft, loose and very friable, nonsticky and nonplastic; cemented material is very hard, very firm; common very fine and fine interstitial pores; violently effervescent; moderately alkaline.

The solum is 16 to 25 inches thick. The A1 horizon has hue of 7.5YR or 5YR, value of 6 or 7 when dry and 4 or 5 when moist, and chroma of 2 to 4. It has few to many fine and medium vesicular pores. The B2t horizon has hue of 5YR or 7.5YR, value of 4 to 6 when moist and 4 or 5 when dry, and chroma of 4 to 6. It is dominantly clay loam. Segregated lime occurs in the lower part of the B2t or B3t horizon, and segregations of fine salt or gypsum, or both, occur in the B3t or C1 horizon of some pedons.

The solum rests unconformably over very gravelly sandy material that is 50 to 85 percent gravel. This material is weakly or strongly cemented with lime below a depth of 28 inches in most pedons. Individual cemented strata rarely exceed 14 inches in thickness and are as thin as 1 inch in some pedons.

Garr series

The Garr series consists of shallow, well drained soils on foothills and mountainsides. These soils formed in residuum derived from metamorphic rock, including gneiss or schist. Slope is 15 to 50 percent.

Typical pedon of Garr very cobbly sandy loam, about 600 feet east and 2,000 feet south of the northwest corner of sec. 30, T. 15 S., R. 70 E.:

A1—0 to 2 inches; light brown (7.5YR 6/4) very cobbly sandy loam, brown (7.5YR 4/4) moist; moderate medium platy structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; few fine vesicular and common very fine and fine interstitial pores; 70 percent cobbles and gravel; violently effervescent; strongly alkaline; abrupt wavy boundary.

B21—2 to 8 inches; light brown (7.5YR 6/4) very gravelly fine sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and few fine and medium roots; few fine tubular and many very fine tubular pores; 70 percent gravel and cobbles; violently effervescent; strongly alkaline; clear wavy boundary.

B22—8 to 12 inches; light brown (7.5YR 6/4) very gravelly fine sandy loam, brown (7.5YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and few fine and medium roots; many very fine interstitial pores; 70 percent gravel and cobbles; violently effervescent; strongly alkaline; clear wavy boundary.

B23ca—12 to 16 inches; light brown (7.5YR 6/4) very gravelly loam, common medium faint brown (7.5YR 5/4) iron stains and common medium distinct white (N 8/0) lime segregations, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine and few fine tubular pores, and many very fine interstitial pores; very few thin clay bridges between sand grains, and clay coats on sand grains; violently effervescent; strongly alkaline; abrupt irregular boundary.

R—16 to 20 inches; black (10YR 2/1) unweathered gneiss bedrock that has white (10YR 8/2) and very pale brown (10YR 7/4) lime coatings on surface and in cracks.

The thickness of the solum and the depth to bedrock range from 12 to 20 inches. The profile has hue of 10YR or 7.5YR, value of 6 or 7 when dry and 4 or 5 when

moist, and chroma of 2 to 4. The control section is fine sandy loam, sandy loam, or light loam that is modified by gravel or cobbles. It is 60 to 85 percent rock fragments. Few or common, fine to coarse lime segregations occur in the horizon immediately above the bedrock, or the bedrock is coated by lime in cracks or on its surface, or both.

Gila series

The Gila series consists of deep, well drained soils on flood plains and low terraces. These soils formed in medium textured mixed alluvium. Slope is 0 to 2 percent.

Typical pedon of Gila loam, about 800 feet west and 660 feet north of the southeast corner of sec. 14, T. 14 S., R. 65 E.:

C1—0 to 2 inches; pink (7.5YR 7/4) loam, brown (7.5YR 5/4) when moist; moderate thin and medium platy structure; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine tubular pores; strongly calcareous; strongly alkaline; abrupt smooth boundary.

C2—2 to 9 inches; pink (7.5YR 7/4) loam that has a fine gravelly coarse sand stratum 1/2 inch thick at the bottom of the horizon, brown (7.5YR 5/4) when moist; weak medium and thick platy structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine and few fine tubular pores; strongly calcareous; strongly alkaline; abrupt smooth boundary.

IIC3—9 to 24 inches; pink (7.5YR 7/4) finely stratified sandy loam, fine sandy loam, and very fine sandy loam, with very fine sandy loam predominating, brown (7.5YR 5/4) when moist; a fine gravelly coarse sand stratum 1 inch thick is at base of horizon; weak medium and thin platy structure; soft, very friable, nonsticky and very slightly sticky, nonplastic and very slightly plastic; common very fine and few fine roots; common very fine and few fine tubular pores; strongly calcareous; moderately alkaline; abrupt smooth boundary.

IIC4—24 to 41 inches; pink (7.5YR 7/4) finely stratified fine sandy loam and very fine sandy loam, with fine sandy loam predominating, brown (7.5YR 5/4) when moist; horizon contains several fine strata of sand 1/2 inch to 1 1/2 inches thick and fine gravelly coarse sand 1 inch thick at the base; weak medium and thick platy structure; soft, very friable, nonsticky and nonplastic; few very fine and fine fibrous roots; common very fine and fine tubular pores; strongly calcareous; moderately alkaline; abrupt smooth boundary.

IIIC5—41 to 60 inches; pink (7.5YR 7/4) finely stratified silt loam, fine sandy loam, sandy loam, and sand, with fine sandy loam predominating, brown (7.5YR 5/4) when moist; weak thin platy structure; slightly hard, very friable, slightly sticky and nonsticky, and slightly plastic and nonplastic; few very fine roots; few very fine and fine tubular pores, mostly horizontal; strongly calcareous; moderately alkaline.

The profile is more than 40 inches deep and is stratified. The thickness and texture of the strata are quite variable. In some pedons the upper horizon is noncalcareous. It has hue of 10YR or 7.5YR, value of 4 to 7 when dry and 4 to 6 when moist, and chroma of 2 to 4. The upper horizon is loam or fine sand. The 10- to 40-inch section is stratified loam, silt loam, very fine sandy loam, fine sandy loam, and sandy loam and is less than 18 percent clay.

Glendale series

The Glendale series consists of deep, well drained soils on flood plains and low stream terraces. These soils formed in mixed alluvium derived from mixed rock sources. Slope is 0 to 2 percent.

Typical pedon of Glendale loam, about 300 feet north and 1,450 feet west of the southeast corner of sec. 15, T. 14 S., R. 65 E.:

A1—0 to 8 inches; light brownish gray (10YR 6/2) loam, brown (10YR 4/3) moist; upper 1/2 inch has weak medium platy structure, and lower 7 1/2 inches is massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine and fine interstitial pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C1—8 to 18 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak fine and coarse subangular blocky structure; very hard, friable, slightly sticky and plastic; few very fine and fine roots; few very fine and fine tubular and few fine interstitial pores; strongly effervescent; common very fine and fine white (N 8/) myceliumlike veins of lime and salt; moderately alkaline; clear smooth boundary.

C2—18 to 42 inches; grayish brown (10YR 5/2) silty clay loam, brown (10YR 4/3) moist; massive; very hard, friable, sticky and plastic; few very fine and fine roots; few very fine tubular pores; strongly effervescent; common to many very fine and fine white (N 8/) myceliumlike veins of lime and salt; moderately alkaline.

C3—42 to 60 inches; grayish brown (10YR 5/2) very fine sandy loam, brown (10YR 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; strongly effervescent; common myceliumlike veins of lime and salt; moderately alkaline.

Some pedons are strongly alkaline throughout. The A horizon has hue of 7.5YR or 10YR, value of 5 to 7 when

dry and 4 or 5 when moist, and chroma of 2 to 4. The C horizon has hue dominantly of 10YR or 7.5YR, but hue ranges to 5YR.

The 10- to 40-inch section of the profile is stratified loam, silt loam, clay loam, or silty clay loam. It is 18 to 35 percent clay and is less than 15 percent sand that is fine or coarser.

Grapevine series

The Grapevine series consists of deep, well drained soils on terraces. These soils formed in loamy alluvium derived from mixed rock sources, including limestone, shale, sandstone, and gypsiferous material. Slope is 0 to 4 percent.

Typical pedon of Grapevine loam, about 320 feet south of the north quarter corner of sec. 9, T. 17 S., R. 64 E.:

A1—0 to 2 inches; pink (7.5YR 7/4) loam, brown (7.5YR 5/4) moist; moderate medium platy structure; soft, very friable; few very fine roots; common very fine and fine vesicular pores; strongly effervescent; strongly alkaline; abrupt smooth boundary.

C1—2 to 10 inches; reddish yellow (7.5YR 7/6) loam, strong brown (7.5YR 5/6) moist; weak coarse prismatic structure; soft, very friable; few fine roots; few fine tubular pores and many very fine interstitial pores; violently effervescent; moderately alkaline; abrupt wavy boundary.

IIC2ca—10 to 21 inches; reddish yellow (7.5YR 7/6) fine sandy loam, light brown (7.5YR 6/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; common fine roots; common fine tubular pores; few fine distinct pinkish white (7.5YR 8/2) lime masses; 10 percent lime coated gravel; violently effervescent; strongly alkaline; abrupt wavy boundary.

IIC3ca—21 to 45 inches; pink (7.5YR 8/4) light clay loam, pink (7.5YR 7/4) moist; massive; very hard, firm, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; common coarse distinct white (N 8/) lime masses and few lime nodules; violently effervescent; strongly alkaline; abrupt wavy boundary.

IIC4cacs—45 to 60 inches; pink (7.5YR 8/4) fine sandy loam, light brown (7.5YR 6/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few medium distinct white (7.5YR 8/2) lime masses; weakly cemented by lime and gypsum; violently effervescent; strongly alkaline.

The calcic horizon is at a depth of 5 to 12 inches. The weakly cemented part of the calcic horizon is at a depth of 24 to 48 inches. This horizon has hue of 7.5YR or 10YR. The A1 and C1 horizons have value of 6 or 7 when dry and 4 or 5 when moist, and they have chroma of 3 to 6. The 10- to 40-inch control section is dominantly fine sandy loam or sandy loam and has strata of loam and light clay loam. It averages less than 18 percent clay. The Cca horizon has value of 7 or 8 when dry and 6 or 7 when moist, and it has chroma of 2 to 6. It has few or common, fine or medium, soft masses of lime that generally increase in size and degree of cementation with depth.

Ireteba series

The Ireteba series consists of deep, well drained soils on the smooth lower margins of alluvial fans and in flat basins. These soils formed in loamy alluvium derived from mixed rock sources, including assorted volcanic and sedimentary rocks. Slope is 0 to 2 percent.

Typical pedon of Ireteba loam, 0 to 2 percent slopes, about 2 miles northwest of Dry Lake Station, about 1,320 feet north and 1,320 feet east of the southwest corner of sec. 8, T. 17 S., R. 64 E.:

A1—0 to 12 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak medium to thick platy structure; slightly hard, friable; slightly sticky and slightly plastic; few fine roots; violently effervescent; moderately alkaline; abrupt smooth boundary.

C1—12 to 18 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; weak medium platy structure; soft, very friable, nonsticky and nonplastic; few fine roots; few fine tubular pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

C2ca—18 to 34 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; massive; very hard, friable, slightly sticky and slightly plastic; very few fine roots; few fine tubular pores; strongly effervescent; few medium faint white (10YR 8/1) lime segregations; moderately alkaline; abrupt smooth boundary.

C3—34 to 54 inches; light brown (7.5YR 6/4) stratified fine sandy loam and loamy fine sand, brown (7.5YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine tubular pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

C4ca—54 to 60 inches; pinkish white (7.5YR 8/2) loam, light brown (7.5YR 6/4) moist; massive; very hard, firm, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

The profile has value of 6 to 8 when dry and 4 to 6 when moist, and it has chroma of 2 to 4. The control section is dominantly stratified fine sandy loam and loam, but in places it has strata of loamy fine sand, gravelly sandy loam, sandy loam, or very fine sandy loam less than 9 inches thick. If mixed, the control section is less than 18 percent clay. The Cca horizon has few to many, fine or medium, distinct lime segregations,

or it has sufficient disseminated lime to impart a high color value. The upper part of the Cca horizon is less than 15 percent calcium carbonate, and the lower part is more than 15 percent. Weakly or strongly lime cemented strata as much as 15 inches thick are at a depth of more than 40 inches in some pedons.

Land series

The Land series consists of deep, somewhat poorly drained soils on smooth flood plains and low terraces. These soils formed in silty alluvium derived from mixed rock sources, including shale, limestone, sandstone, assorted volcanic rocks, and reworked old lake-laid deposits. In places the soils are incised by shallow drainageways or the soil surface is hummocky as a result of deposition by wind. Slope is 0 to 2 percent.

Typical pedon of Land silty clay loam, about 1/2 mile north of the junction of U.S. Highways 93 and 91 near Glendale, Nevada; about 300 feet north and 300 feet east of the southwest corner of sec. 35, T. 14 S., R. 66 E.:

A1—0 to 4 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate very fine granular structure; hard, friable, very sticky and very plastic; common very fine and fine roots; many very fine and fine roots; many very fine tubular pores; strongly effervescent; strongly alkaline; abrupt slightly wavy boundary.

C1sa—4 to 6 inches; white (10YR 8/1) silty clay, brown (10YR 4/3) moist; the white color is a result of a mass of salt crystals; moderate fine granular structure; hard, firm, very sticky and very plastic; few very fine and fine roots; many very fine interstitial pores and few very fine tubular pores; effervescent; strongly alkaline; clear slightly wavy boundary.

C2sa—6 to 8 inches; light brownish gray (10YR 6/2) silty clay, brown (10YR 4/3) moist; about 60 percent of the surface consists of white (10YR 8/1) very fine crystals of salt that disappear when soil is moist; moderate fine granular structure; soft to hard when dry, friable, very sticky and very plastic; few very fine and fine roots; many very fine interstitial pores and few very fine tubular pores; effervescent; strongly alkaline; abrupt smooth boundary.

C3sa—8 to 14 inches; grayish brown (10YR 5/2) silty clay loam, brown (10YR 4/3) moist; strong medium to very fine granular structure; hard, friable, very sticky and very plastic; few fine and very fine roots; many very fine interstitial pores; strongly effervescent; moderately alkaline; diffuse smooth boundary.

C4—14 to 22 inches; light grayish brown (10YR 6/2) silty clay loam, brown (10YR 4/3) moist; strong medium granular structure; very hard, friable, very sticky and very plastic; few very fine and fine roots; many very fine and few fine interstitial pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C5—22 to 30 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; strong medium granular structure; hard, firm, sticky and plastic; few fine and very fine roots; many very fine and few fine interstitial pores; strongly effervescent; strongly alkaline; abrupt smooth boundary.

IIC6—30 to 42 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; weak thick platy structure; slightly hard, friable, sticky and plastic; few fine and very fine roots; many very fine and few fine tubular pores; strongly effervescent; strongly alkaline; abrupt smooth boundary.

IIIC7—42 to 60 inches; very pale brown (10YR 8/3) silty clay, pale brown (10YR 6/3) moist; massive; hard, firm, very sticky and very plastic; many very fine tubular pores; strongly effervescent; strongly alkaline.

The profile has hue of 10YR and 7.5YR. The A1 horizon has value of 5 to 7 when dry and 4 or 5 when moist, and it has chroma of 2 to 4. The surface commonly has polygonal cracks 5 to 8 inches across. The Csa horizon ranges from 1 to 28 inches in depth, but it is at a depth of 1 to 8 inches in undisturbed areas. It is more than 5 percent salt in undisturbed areas but is as little as 2 percent salt in cultivated areas. The Csa horizon is 8 to 25 inches thick. The upper part commonly is white when dry. The control section is dominantly silty clay loam or silt loam, but it has thin strata of fine sandy loam, very fine sandy loam, loam, clay loam, or silty clay. The profile is calcareous throughout, and in some pedons it has segregations below the Csa horizon. The profile is high in gypsum, and it commonly has a considerable number of crystalline segregations. An A1 horizon of wind-deposited loamy fine sand occurs in some places. Wet phases are recognized in areas adjacent to the Virgin River where the water table is as close to the surface as 2 feet.

Moapa series

The Moapa series consists of moderately deep, excessively drained soils on uplands. These soils formed in residuum derived from sandstone and in wind-reworked material that includes a small admixture of limestone. Slope is 4 to 30 percent.

Typical pedon of a Moapa fine sand in an area of Rock land-Moapa association, hilly, about 8 miles southwest of the junction of U.S. Highway 91 and Nevada Highway 12 in the Valley of Fire State Park; about 600 feet east and 700 feet south of the northwest corner of sec. 7, T. 16 S., R. 67 E.:

A1—0 to 4 inches; light yellowish brown (10YR 6/4) fine sand, dark yellowish brown (10YR 4/4) moist; single

grain; loose; many very fine roots; many very fine interstitial pores; slightly effervescent; moderately alkaline; clear smooth boundary.

C1—4 to 12 inches; light yellowish brown (10YR 6/4) fine sand, dark yellowish brown (10YR 4/4) moist; single grain; loose; common fine and very fine roots; many very fine interstitial pores; strongly effervescent; strongly alkaline; clear smooth boundary.

C2—12 to 30 inches; light yellowish brown (10YR 6/4) fine sand, yellowish brown (10YR 5/4) moist; single grain; loose; few fine and common very fine roots; many very fine interstitial pores; strongly effervescent; strongly alkaline; abrupt wavy boundary.

C3r—30 to 36 inches; white (10YR 8/2) sandstone, very pale brown (10YR 7/3) moist; very hard, very firm; can be dug with a tile spade with difficulty; strongly effervescent.

Bedrock is at a depth of 20 to 40 inches. The profile is lithochromic. It has hue of 2.5YR to 10YR, value of 6 or 7 when dry and 4 to 6 when moist, and chroma of 3 to 6. The control section is dominantly fine sand, but it is sand in some pedons. Gravel less than 2 inches in size and making up as much as 30 percent of a given horizon is present in the C horizon. The A1 horizon is slightly effervescent to violently effervescent. Few or common, medium or coarse lime segregations are above the paralithic contact in some pedons.

Mormon Mesa series

The Mormon Mesa series consists of shallow, well drained soils on smooth, old valley-fill terraces. These soils formed in Tertiary valley-fill deposits derived dominantly from limestone and an admixture of quartzite and sandstone. Slope is 0 to 8 percent.

Typical pedon of Mormon Mesa fine sandy loam, 0 to 8 percent slopes, about 3 miles northeast on U.S. Highway 91 from its junction with Nevada State Highway 12 and 1/2 mile south of highway; about 800 feet north and 1,300 feet east of the southwest corner of sec. 28, T. 13 S., R. 69 E.:

A1—0 to 2 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 4/3) moist; moderate medium and thin platy structure; slightly hard, friable, nonsticky and slightly plastic; few fine roots; many very fine interstitial and many fine vesicular pores; violently effervescent; moderately alkaline; abrupt smooth boundary.

C1—2 to 10 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 4/3) moist; weak medium and fine granular structure; slightly hard, very friable, nonsticky and nonplastic; few fine roots; few fine tubular and many very fine interstitial pores; violently effervescent; few fine prominent white (10YR 8/2) lime coatings in root channels; moderately alkaline; clear wavy boundary.

C2ca—10 to 16 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine roots; many very fine interstitial pores; violently effervescent; common and many very fine and fine prominent white (10YR 8/1) lime segregations; strongly alkaline; abrupt wavy boundary.

C3cam—16 to 60 inches; white and pink (N 8/ and 7.5YR 8/4) indurated hardpan, light brown (7.5YR 6/4) moist; massive; extremely hard, extremely firm; the upper 2 inches has many very fine laminae; violently effervescent; moderately alkaline.

The Ccam horizon is at a depth of 7 to 20 inches. The part of the profile above the hardpan has hue of 5YR or 7.5YR, value of 5 to 8 when dry and 4 to 6 when moist, and chroma of 2 to 4. Rock fragments make up 0 to 10 percent of any part of the profile above the hardpan. They consist mainly of gravel- or cobble-sized pan fragments, but some limestone and quartzite pebbles are present in some pedons. The Ccam horizon commonly contains no rock fragments except in recemented solution cavities.

Nickel series

The Nickel series consists of deep, well drained soils on dissected terraces. These soils formed in very deep, very gravelly alluvium derived from gneiss, granite, limestone, and small amounts from quartzite. Slope is 15 to 30 percent.

Typical pedon of a Nickel gravelly sandy loam in an area of Nickel-Arizo association, rolling, about 1 1/2 miles northwest of Seeps Corral; about 1,000 feet east of the center of sec. 34, T. 14 S., R. 70 E.:

A1—0 to 3 inches; pale brown (10YR 6/3) gravelly sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 30 percent gravel; violently effervescent; strongly alkaline; clear smooth boundary.

C1—3 to 7 inches; light brown (7.5YR 6/3) gravelly sandy loam, brown (7.5YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine interstitial pores; 35 percent gravel; violently effervescent; moderately alkaline; abrupt wavy boundary.

C2—7 to 11 inches; light brown (7.5YR 6/3) very gravelly sandy loam, brown (10YR 4/3) moist; weak subangular blocky structure; soft, very friable, non-

sticky and nonplastic; common very fine roots and few fine roots; many very fine interstitial pores; 85 percent gravel; violently effervescent; strongly alkaline; abrupt wavy boundary.

C3ca—11 to 19 inches; white (10YR 8/2) very gravelly sandy loam, light gray (10YR 7/2) moist; massive; hard and very hard, friable and firm, nonsticky and nonplastic; few very fine and fine roots; many very fine and few fine interstitial pores; weakly lime cemented lenses 1 to 2 inches thick; 80 percent lime-coated gravel; violently effervescent; moderately alkaline; abrupt wavy boundary.

C4—19 to 60 inches; light brownish gray (10YR 6/2) very gravelly sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine and common fine interstitial pores; 80 percent gravel, some of which has thin lime coats on underside; few thin weakly lime cemented very hard and firm strata 1 to 3 inches thick; violently effervescent; moderately alkaline.

The profile, except for the Cca horizon, has hue of 10YR or 7.5YR, value of 6 to 8 when dry and 4 to 7 when moist, and chroma of 2 or 3. The control section is dominantly very gravelly sandy loam, but in some pedons it is very gravelly coarse sandy loam. The control section averages 50 to 80 percent coarse fragments that are dominantly 1/2 inch to 1 1/2 inches in diameter. Individual strata are 30 to 90 percent coarse fragments. The Cca horizon is at a depth of 10 to 25 inches and consists of interbedded, noncemented, marly material that has weakly cemented lenses. The marly material is slightly hard or hard when dry and very friable or friable when moist. The weakly cemented lenses are very hard when dry and firm or very firm when moist. The part of the C horizon below the Cca horizon has several weakly lime cemented lenses 1 inch to 3 inches thick.

Overton series

The Overton series consists of deep, very poorly drained soils on smooth flood plains. These soils formed in clayey alluvium derived from mixed sedimentary rock and reworked lacustrine material. Slope commonly is less than 0.3 percent, but it is as much as 2 percent.

Typical pedon of Overton silty clay, in Moapa Valley, about 400 feet north and 100 feet east of the center of sec. 22, T. 15 S., R. 67 E.:

Ap—0 to 7 inches; gray (2.5Y 5/1) silty clay, gray (2.5Y 6/1) crushed, very dark grayish brown (2.5Y 3/2) moist; dark grayish brown (2.5Y 4/2) moist and crushed; moderate coarse and medium subangular blocky structure; very hard, friable, very sticky and very plastic; many very fine and fine roots; many very fine and fine tubular pores; violently effervescent; strongly alkaline; clear smooth boundary.

A1—7 to 16 inches; gray (2.5Y 5/1) clay, gray (2.5Y 6/1) crushed, very dark grayish brown (2.5Y 3/2) moist, dark grayish brown (2.5Y 4/2) moist and crushed; weak coarse prismatic structure that parts to moderate medium subangular blocky; very hard, firm, very sticky and very plastic; many very fine and fine roots; many very fine and fine tubular pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

B2g—16 to 19 inches; light gray (5Y 6/1) silty clay, gray (5Y 5/1) moist; many fine and medium faint gray (5Y 5/1) mottles, many fine prominent reddish brown (5YR 4/4) mottles and many fine distinct very dark grayish brown (2.5Y 3/2) mottles, very few fine prominent white (10YR 8/2) gypsum flecks; weak medium and coarse prismatic structure; hard, firm, very sticky and very plastic; many very fine roots; many very fine tubular pores; violently effervescent; strongly alkaline; clear wavy boundary.

C1g—19 to 25 inches; pale yellow (5Y 8/3) silty clay, pale olive (5Y 6/3) moist; many medium and fine prominent brown (7.5YR 4/4) and strong brown (7.5YR 5/8) mottles; weak medium prismatic structure; hard, friable, very sticky and very plastic; common very fine roots; many very fine and fine tubular pores; violently effervescent; strongly alkaline; abrupt wavy boundary.

C2—25 to 30 inches; pale yellow (2.5Y 7/4) and very pale brown (10YR 7/3) finely stratified fine sandy loam and clay loam, light yellowish brown (2.5Y 6/4) and pale brown (10YR 6/3) moist; many coarse distinct strong brown (7.5YR 5/8) mottles; weak medium and fine granular structure; slightly hard and hard, friable, nonsticky and sticky, nonplastic and plastic; common very fine roots; many very fine and fine interstitial pores; violently effervescent; strongly alkaline; abrupt wavy boundary.

C3—30 to 60 inches; light reddish brown (5YR 6/4) silty clay, reddish brown (5YR 4/4) moist; few fine faint yellowish red (5YR 5/6) mottles and few thin reddish brown (2.5YR 4/4) strata 1/8 inch thick; weak thick platy structure; very hard, very firm, very sticky and very plastic; few very fine and fine roots; many very fine and fine tubular pores; violently effervescent; strongly alkaline.

The control section is dominantly silty clay. It has thin strata of clay loam to loamy fine sand in the lower part. It averages 35 to 60 percent clay. The A horizon has hue of 2.5Y or 5Y, value of 5 or 6 when dry and 3 or 4 when moist, and chroma of 1 or 2. The upper part of the C horizon has hue of 5Y or 2.5Y, value of 6 to 8 when dry and 4 or 5 when moist, and chroma of 1 to 3. It has common or many, fine to coarse, high-chroma, greenish and bluish mottles and some low-chroma mottles. The

lower part of the C horizon has hue of 2.5Y to 5YR, value of 6 or 7 when dry and 5 or 6 when moist, and chroma of 2 to 4. It has mottles similar to those in the upper part of the C horizon.

Overton Variant

The Overton Variant consists of deep, somewhat poorly drained soils on smooth flood plains. These soils formed in alluvium derived mainly from sandstone, shale, and limestone. Slope is 0 to 2 percent.

Typical pedon of Overton silt loam, loamy variant, slightly saline, about 1,000 feet west of the Overton Airport road, near the center of sec. 12, T. 16 S., R. 67 E.:

A1—0 to 11 inches; grayish brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist, moderate coarse and medium subangular blocky structure parting to weak medium and fine granular; very hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine tubular pores; strongly effervescent; strongly alkaline; clear smooth boundary.

C1—11 to 31 inches; light gray (2.5Y 7/2) stratified loamy fine sand, fine sandy loam, and silt loam, grayish brown (2.5Y 5/2) moist; weak thin platy structure, soft, very friable, nonsticky and nonplastic; many very fine and common fine roots; common very fine and fine tubular pores; strongly effervescent; strongly alkaline; clear smooth boundary.

C2—31 to 60 inches; light brownish gray (2.5Y 6/2) stratified fine sandy loam and clay loam, grayish brown (2.5Y 5/2) moist highly mottled with brown (7.5YR 4/4) and strong brown (7.5YR 5/8); massive, hard, friable, nonsticky and nonplastic; few very fine roots; many very fine roots; many very fine and few fine interstitial pores; strongly effervescent; strongly alkaline.

The profile has hue of 2.5Y or 5Y, and it has value of 5 to 7 when dry and 4 or 5 when moist. The control section is stratified and includes silty clay loam, clay loam, fine sandy loam, and loamy fine sand. Lime content of the profile is highly variable, but it generally is higher in the finer textured material. Fine salt and gypsum segregations can occur in any part of the profile, but they commonly are in the lower part. Mottles generally are below a depth of 30 inches.

Pulsipher series

The Pulsipher series consists of shallow, well drained soils on foothills and the lower slopes of mountains. These soils formed in material derived from metamorphic rock, mainly gneiss and schist. Slope is 15 to 30 percent.

Typical pedon of Pulsipher gravelly loam in an area of Pulsipher-Rock outcrop complex, 15 to 30 percent slopes, about 600 feet north of the apparent center of sec. 11, T. 15 S., R. 70 E.:

A1—0 to 2 inches; grayish brown (2.5Y 5/2) gravelly loam, very dark grayish brown (2.5Y 3/2) moist; weak thin and medium platy structure; soft, very friable, slighty sticky and slightly plastic; many very fine roots; few very fine and fine vesicular pores and many very fine interstitial pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

B2—2 to 15 inches; grayish brown (2.5Y 5/2) very gravelly sandy loam, very dark grayish brown (2.5Y 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots and few medium roots; many very fine interstitial pores, common very fine and fine pores, and few medium tubular pores; strongly effervescent; moderately alkaline; abrupt wavy boundary.

Cr—15 to 18 inches; very dark gray (10YR 3/1) weathered mica schist; common coarse and very coarse white (10YR 8/2) lime coatings along fracture planes; original rock structure; can be dug easily with a tile spade.

R—18 inches; extremely hard mica schist.

The solum is 10 to 19 inches thick. Unweathered bedrock is at a depth of 12 to 20 inches. The control section has hue of 2.5Y or 10YR, value of 5 or 6 when dry and 3 or 4 when moist, and chroma of 2 or 3. It has an average texture of very gravelly coarse sandy loam, very gravelly sandy loam, or very gravelly loam. The control section is less than 18 percent clay and is 50 to 75 percent gravel and cobbles. The profile commonly is calcareous, but it is noncalcareous in some of the shallower pedons. Few or common soft lime masses or thin lime coatings are on the underside of rock fragments in the lower 5 inches. They are immediately above the bedrock or are present as coatings on the surface of the bedrock and in crevices.

Pulsipher Variant

The Pulsipher Variant consists of shallow, well drained soils on foothills and mountains. These soils formed in residuum derived from metamorphic rock, mainly mica schist. Slope is 15 to 30 percent.

Typical pedon of Pulsipher gravelly clay loam, fine variant, 15 to 30 percent slopes, about 1,500 feet west and 200 feet north of the southeast corner of sec. 31, T. 14 S., R. 71 E.:

A1—0 to 6 inches; light reddish brown (5YR 6/3) gravelly clay loam, reddish brown (5YR 5/3) moist; weak medium and fine subangular blocky structure; hard, friable; many fine roots; many very fine and fine

tubular pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

B2t—6 to 14 inches; reddish yellow (5YR 6/6) gravelly clay, yellowish red (5YR 5/6) moist, weak medium and fine subangular blocky structure; hard, friable; many fine roots; many very fine and fine tubular pores; slightly effervescent; moderately alkaline; abrupt wavy boundary.

R—14 inches; unweathered mica schist.

Bedrock is at a depth of 12 to 20 inches. Hue is dominantly 5YR, but it ranges to 7.5YR in some pedons. Value is 4 to 6, and chroma is 3 to 6. The B2t horizon is gravelly clay loam or gravelly clay.

Spring series

The Spring series consists of deep, moderately well drained soils on low terraces. These soils formed in gypsiferous lacustrine sediment of the Muddy Creek Formation. Some areas include material derived from limestone and shale. Slope is 0 to 2 percent.

Typical pedon of Spring silty clay loam, about 2 miles southwest of Crystal, Nevada; about 1,320 feet south and 1,760 feet west of the northeast corner of sec. 12, T. 17 S., R. 64 E.:

A1—0 to 5 inches; light reddish brown (5YR 6/4) silty clay loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure parting to weak medium and fine granular; slightly hard, very friable, sticky and plastic; few fine roots increasing to common in the lower part; few very fine tubular pores and many very fine interstitial pores; few fine prominent white (10YR 8/1) gypsum crystals; violently effervescent; moderately alkaline; clear smooth boundary.

C1—5 to 10 inches; light reddish brown (5YR 6/4) clay loam, reddish brown (5YR 4/4) moist; moderate coarse prismatic structure grading to massive in lower part; hard, very friable, sticky and plastic; common fine roots; common very fine tubular pores; few grading to common very fine and fine prominent white (10YR 8/1) gypsum crystals and crystal clusters; violently effervescent; moderately alkaline; abrupt smooth boundary.

C2cs—10 to 21 inches; pink (5YR 7/3) clay loam, light reddish brown (5YR 6/4) moist; massive; hard, friable, sticky and plastic; common fine roots; common very fine and fine tubular pores; many fine prominent white (10YR 8/1) gypsum crystals; slightly effervescent; mildly alkaline; clear smooth boundary.

C3cs—21 to 43 inches; pink (5YR 8/3) light clay loam that is very high in gypsum, pink (5YR 7/3) moist; massive; hard, friable, sticky and plastic; few fine roots; few fine and very fine tubular pores; neutral; clear wavy boundary.

C4cs—43 to 49 inches; pink (5YR 7/3) silt loam, reddish brown (5YR 5/3) moist; massive; hard, friable, nonsticky and slightly plastic; few fine roots; many very fine and few fine tubular pores; common fine distinct white (10YR 8/1) gypsum crystals; neutral; clear wavy boundary.

C5cs—49 to 60 inches; pink (5YR 7/4) silt loam that is high in gypsum; reddish brown (5YR 5/4) moist; massive; slightly hard, friable, nonsticky and slightly plastic; no roots; few very fine tubular pores; strongly effervescent; mildly alkaline.

The gypsic horizon is at a depth of 8 to 18 inches. The control section, between depths of 10 and 40 inches, averages clay loam or silty clay loam and is less than 35 percent clay. Strata of silt loam, very fine sandy loam, fine sandy loam, or light clay are in some pedons. The A horizon has value of 6 or 7 when dry and 4 or 5 when moist, and it has chroma of 3 or 4. The gypsic horizon has value of 7 or 8 when dry and 5 to 7 when moist, and it has chroma of 2 or 3. It is soft to very hard when dry. It is estimated at 20 to 30 percent gypsum. Layers of this horizon range from noneffervescent to violently effervescent. The C1 horizon in some pedons is less than 15 percent gypsum.

St. Thomas series

The St. Thomas series consists of shallow, well drained soils on foothills and mountains. These soils formed in residuum derived from limestone. Slope is 15 to 50 percent.

Typical pedon of St. Thomas cobbly loam in an area of Rock land-St. Thomas association, very steep, about 1.85 miles south from Glendale toward Overton, Nevada, on Nevada Highway 12 and U.S. Highway 91, about 50 feet west of the pavement; about 100 feet west and 600 feet north of the west quarter corner of sec. 9, T. 15 S., R. 67 E.:

A1—0 to 2 inches; very pale brown (10YR 7/3) cobbly loam, pale brown (10YR 6/3) moist; weak medium and thin platy structure; slightly hard, very friable, slightly plastic; few very fine roots; many fine and very fine vesicular pores; 30 percent stones, cobbles, and gravel; violently effervescent; moderately alkaline; abrupt wavy boundary.

C—2 to 12 inches; very pale brown (10YR 7/3) very cobbly loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, nonsticky and slightly plastic; few very fine roots; many very fine and fine pores and few medium interstitial pores; 60 percent stones, cobbles, and gravel; violently effervescent, few pockets and veins of white (10YR 8/2) soft lime nodules 1/4 to 1/2 inch in diameter near the lower boundary; moderately alkaline; abrupt wavy boundary.

R—12 to 13 inches; light gray (10YR 7/2) and white (10YR 8/2) extremely hard limestone with a thin capping of secondary calcium carbonate 1/16 to 1/8 inch thick.

Bedrock is at a depth of 4 to 20 inches. The profile has hue of 10YR or 7.5YR, value of 7 or 8 when dry and 6 or 7 when moist, and chroma of 2 or 3. The solum is 50 to 80 percent stones, cobbles, and gravel. Soft lime masses commonly are in the lower part of the C horizon except where the C horizon is thin. Thin lime coatings are on the underside of rock fragments in some pedons.

Tobler series

The Tobler series consists of deep, well drained soils on smooth flood plains and low alluvial fans. These soils formed in alluvium derived from sandstone and an admixture of shale and limestone. Slope is 0 to 2 percent.

Typical pedon of Tobler fine sandy loam, about 1,320 feet west and 1,320 feet north of the southwest corner of sec. 13, T. 16 S., R. 67 E.:

A1—0 to 13 inches; light reddish brown (2.5YR 6/4) fine sandy loam, reddish brown (2.5YR 5/4) moist; granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; many very fine and fine vesicular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—13 to 60 inches; light reddish brown (2.5YR 6/4) stratified fine sandy loam, loamy fine sand, and silt loam, reddish brown (2.5YR 5/4) moist; moderate fine and medium platy structure in upper 20 inches and massive below; hard, very friable, slightly sticky and slightly plastic; few fine and medium roots; common very fine and fine tubular pores; strongly to very strongly effervescent; moderately alkaline.

The solum has hue of 2.5YR or 5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 2 to 4. The control section averages fine sandy loam, but it has strata of silt loam, loamy fine sand, and heavy fine sandy loam less than 15 inches thick. In some pedons it is as much as 10 percent gravel. Fine salt and gypsum segregations can occur in any part of the profile, but they commonly are in the C horizon. Lime content is variable, but it generally is higher in the finer textured layers.

Tonopah series

The Tonopah series consists of deep, excessively drained soils on convex, smooth alluvial fans and terraces. These soils formed in very gravelly, cobbly, or stony sandy alluvium derived mainly from limestone, sandstone, conglomerate, and quartzite. Slope is 0 to 15 percent.

Typical pedon of Tonopah gravelly sandy loam, 0 to 4 percent, about 1,320 feet west and 1,320 feet north of the southeast corner of sec. 22, T. 15 S., R. 65 E.:

A1—0 to 1 inch; light brown (7.5YR 6/4) gravelly sandy loam, brown (7.5YR 4/3) moist; weak medium platy structure; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine and fine vesicular pores and common very fine tubular pores; 50 percent cobbles and gravel; violently effervescent; moderately alkaline; abrupt smooth boundary.

C1—1 to 6 inches; light brown (7.5YR 6/4) gravelly sandy loam, brown (7.5YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine roots; many very fine and fine interstitial pores; 50 percent cobbles and gravel; violently effervescent; strongly alkaline; gradual smooth boundary.

C2—6 to 22 inches; light brown (7.5YR 6/4) very gravelly sand, brown (7.5YR 5/4) moist; massive; soft, very friable; few fine roots; many very fine and fine interstitial pores and few medium interstitial pores; 80 percent gravel and cobbles; violently effervescent; strongly alkaline; clear wavy boundary.

C3ca—22 to 33 inches; light brown (7.5YR 6/4) very gravelly sand, brown (7.5YR 5/4) moist; massive; soft, very friable; few fine roots; many very fine and fine interstitial pores; 80 percent gravel and cobbles; white (10YR 8/2) lime coatings on all rock fragments; weakly lime cemented in pockets and seams; violently effervescent; strongly alkaline; clear wavy boundary.

C4—33 to 60 inches; light brown (7.5YR 6/4) very gravelly sand, brown (7.5YR 5/4) moist; single grain; loose; few fine roots; many very fine and fine interstitial pores; 80 percent gravel and cobbles; some rock fragments have lime coatings on their underside; violently effervescent; strongly alkaline.

The calcic horizon is at a depth of 18 to 30 inches. The 10- to 40-inch control section is very gravelly sand on loamy sand and is 50 to 85 percent rock fragments. It averages 40 to 65 percent gravel and is as much as 20 percent cobbles. It generally has hue of 7.5YR or 10YR, value of 6 or 7 when dry and 5 to 7 when moist, and chroma of 2 to 4, but the calcic horizon includes value of 8 when dry. In some pedons thin layers of weakly cemented to indurated Cca horizon occur below a depth of 40 inches.

Toquop series

The Toquop series consists of deep, excessively drained soils on smooth, broad terraces adjacent to perennial streams and on slightly convex alluvial fans. These soils formed in very deep sandy alluvium derived mainly from unconsolidated, calcareous, sandy Tertiary basin-fill material or weakly consolidated sandstone of

older geologic age. There are minor admixtures of material derived from limestone. Slope is 0 to 8 percent.

Typical pedon of Toquop fine sand, about 3.1 miles west of Mesquite Post Office on U.S. Highway 91 and about 200 feet southeast of the highway; about 200 feet east and 1,000 feet south of the north quarter corner of sec. 24, T. 13 S., R. 71 E.:

A1—0 to 9 inches; pink (5YR 8/4) fine sand, yellowish red (5YR 5/6) moist; single grain; loose; few very fine roots; many very fine interstitial pores; strongly effervescent; strongly alkaline; clear smooth boundary.

C1—9 to 26 inches; pink (5YR 8/4) fine sand, yellowish red (5YR 5/6) moist; single grain; loose; few fine roots; many very fine interstitial pores; strongly effervescent; strongly alkaline; clear smooth boundary.

C2—26 to 43 inches; pink (5YR 8/4) fine sand, yellowish red (5YR 5/6) moist, very few fine distinct pinkish white (7.5YR 8/2) thin veins or filaments of gypsum or lime; single grain; loose; few very fine roots; many very fine interstitial pores; strongly effervescent; strongly alkaline; clear smooth boundary.

C3—43 to 57 inches; pink (5YR 8/4) fine sand, yellowish red (5YR 5/6) moist; few fine and medium distinct pinkish white (7.5YR 8/2) thin veins or filaments of gypsum or lime; single grain; loose; few very fine roots; many very fine interstitial pores; strongly effervescent; moderately alkaline.

The profile is lithochromic. It has hue of 5YR to 10YR, value of 5 to 8 when dry and 4 to 6 when moist, and chroma of 3 to 6. In some undisturbed areas, very fine to medium gypsum or lime segregations are below a depth of 20 inches. The control section is dominantly fine sand or sand, but in some pedons it is stratified with thin layers of loamy fine sand or loamy sand as much as 6 inches thick. It averages less than 15 percent gravel.

Vinton series

The Vinton series consists of deep, well drained soils on smooth flood plains and low terraces. These soils formed in sandy alluvium derived mainly from sandstone, quartzite, and a small amount of mica and rhyolite. Slope is 0 to 4 percent.

Typical pedon of Vinton fine sand, northeast of Littlefield, Arizona; about 1,320 feet north and 2,640 feet east of the southwest corner of sec. 4, T. 40 N., R. 15 W.:

Ap—0 to 12 inches; brown (10YR 5/3) fine sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; many fine interstitial pores; approximately 10 percent fine gravel; slightly effervescent; mildly alkaline; clear smooth boundary.

C1—12 to 24 inches; yellowish brown (10YR 5/4) loamy sand that has thin strata of sandy loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine roots; many fine interstitial pores; 10 percent fine gravel; slightly effervescent; moderately alkaline; clear smooth boundary.

C2—24 to 36 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many fine interstitial pores and few very fine tubular pores; 10 percent fine gravel; slightly effervescent; moderately alkaline; clear smooth boundary.

C3—36 to 48 inches; yellowish brown (10YR 5/4) loamy sand, dark brown (10YR 3/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many fine interstitial pores; 10 percent fine gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

C4—48 to 60 inches; yellowish brown (10YR 5/4) fine sand, dark brown (10YR 3/4) moist; single grain; loose, nonsticky and nonplastic; many fine interstitial pores; few fine pebbles; strongly effervescent; moderately alkaline.

Carbonates commonly are disseminated, but some are in the form of myceliumlike threads in the C horizon. The profile has hue of 7.5YR or 10YR, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 2 to 4. The control section is dominantly loamy sand. In some pedons it has one to several loamy or silty strata that average 1/2 inch to 2 inches in thickness but are as much as 5 inches in thickness. The profile commonly is nongravelly, but any one stratum can contain as much as 15 percent gravel.

Virgin Peak series

The Virgin Peak series consists of shallow, well drained soils on mountains. These soils formed in material weathered from gneiss and schist. Slope is 30 to 75 percent.

Typical pedon of Virgin Peak very gravelly loam in an area of Virgin Peak-Rock land association, very steep, about 3 miles southeast of Keywest Corral on the crest of Virgin Mountain; about 600 feet north and 800 feet east of the southwest corner of sec. 25, T. 15 S., R. 70 E.:

A1—0 to 6 inches; brown (10YR 4/3) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and medium roots; many very fine and fine interstitial pores; neutral; abrupt irregular boundary.

Cr—6 to 14 inches; yellowish brown (7.5YR 6/6) decomposing gneiss that can be excavated easily with a

tile spade but retains original rock structure, strong brown (7.5YR 5/6) moist; massive; very hard, very firm, nonsticky and nonplastic; common very fine and few fine roots in fractures; few very fine and fine interstitial pores; neutral; diffuse smooth boundary.

R—14 to 20 inches; grayish brown (10YR 6/2) extremely hard gneiss bedrock.

The paralithic contact is at a depth of 5 to 10 inches, and the lithic contact is at a depth of 13 to 20 inches. The A1 horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3. It is less than 18 percent clay and is 50 to 75 percent rock fragments. Content of gravel ranges from 40 to 75 percent, and content of stones and cobbles is as much as 15 percent. The C horizon has value at least one unit higher than the A horizon when dry or moist, and it has chroma of 3 to 6 in some pedons.

Virgin River series

The Virgin River series consists of deep, somewhat poorly drained soils on smooth flood plains. These soils formed in clayey alluvium derived from mixed sedimentary rock sources, including shale, siltstone, limestone, and sandstone. Slope is commonly less than 0.5 percent, but it ranges from 0 to 2 percent.

Typical pedon of Virgin River silty clay, about 1 mile west of the Bunkerville schoolhouse, about 500 feet north of the apparent south quarter corner of sec. 26, T. 13 S., R. 70 E.:

Ap—0 to 6 inches; light reddish brown (5YR 6/3) silty clay, dark reddish brown (5YR 3/4) moist; moderate medium and fine granular structure; hard, friable, very sticky and very plastic; many very fine roots; many very fine interstitial pores and common very fine tubular pores; few worm casts; violently effervescent; moderately alkaline; abrupt smooth boundary.

C1—6 to 19 inches; light reddish brown (5YR 6/3) silty clay, reddish brown (5YR 3/4) moist; weak coarse subangular blocky structure breaking to moderate medium subangular blocky; hard, firm, very sticky and very plastic; common very fine roots; common very fine and fine tubular pores and few medium tubular pores; common worm casts; violently effervescent; moderately alkaline; abrupt wavy boundary.

C2—19 to 26 inches; light reddish brown (5YR 6/3) heavy clay loam, reddish brown (5YR 4/3) moist; few medium prominent pale olive (5YR 6/3) streaks and splotches; moderate coarse subangular blocky structure; hard, firm, sticky and very plastic; common very fine roots; common very fine and few fine tubular pores; 3-inch pocket of fine sand; few worm casts; violently effervescent; moderately alkaline; abrupt smooth boundary.

C3—26 to 35 inches; light reddish brown (5YR 6/4) clay, reddish brown (5YR 4/4) moist; few medium prominent black (10YR 2/1) organic stains in pores and root channels; few medium distinct brown (10YR 5/3) and few medium faint yellowish red (5YR 5/8) iron mottles; few medium and coarse distinct reddish brown (2.5YR 4/4) clay particles; weak thick to thin platy structure; hard, firm, very sticky and very plastic; common very fine roots, and few dead coarse mesquite roots 1 inch in diameter; very few fine and medium tubular pores and few very fine tubular pores; violently effervescent; moderately alkaline; abrupt smooth boundary.

IIC4—35 to 48 inches; light reddish brown (5YR 6/3) finely stratified loamy fine sand and fine sand, reddish brown (5YR 4/3) moist; few fine faint yellowish red (5YR 5/8) iron mottles at top of the horizon, which increase to common medium near base; weak fine and medium granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots; very few very fine and few fine tubular pores; violently effervescent; moderately alkaline; clear wavy boundary.

IIIC5—48 to 62 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 4/4) moist; common fine faint yellowish red (5YR 5/8) iron mottles and few medium prominent olive (5Y 5/3) iron stains; weak fine subangular blocky structure; hard, very friable, nonsticky and nonplastic; few very fine roots; few very fine tubular pores; violently effervescent; moderately alkaline.

The control section has strata of clay, silty clay, or heavy clay loam. In some pedons erratic strata with texture as coarse as sand occur in the lower 10 inches of the control section. These coarser textured strata are less than 13 inches thick and do not occur above a depth of 24 inches. The control section after mixing is 35 to 60 percent clay. The profile dominantly has hue of 5YR, but hue ranges from 2.5YR to 7.5YR. Hue of 7.5YR occurs only in the sandy strata. The profile has value of 5 to 7 when dry and 4 or 5 when moist, and it has chroma of 3 or 4. Horizons less than 3 inches thick and containing many salt and gypsum crystals are in some undisturbed areas, generally between depths of 3 and 10 inches. In some pedons soft lime concretions occur immediately above the water table.

Virgin River Variant

The Virgin River Variant consists of deep, poorly drained soils on smooth flood plains. These soils formed in clayey alluvium derived mainly from limestone and admixtures of sandstone and shale. Slope is 0 to 2 percent.

Typical pedon of Virgin River silty clay loam, wet variant, north of Bunkerville; about 2,640 feet north and

1,320 feet east of the southwest corner of sec. 25, T. 13 S., R. 71 E.:

Ap—0 to 6 inches; light reddish brown (5YR 6/3) silty clay loam, dark reddish brown (5YR 3/4) moist; weak coarse subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; many very fine tubular pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C1—6 to 28 inches; light reddish brown (5YR 6/3) silty clay loam, reddish brown (5YR 3/4) moist; few medium faint yellowish red (5YR 5/8) iron mottles; few faint salt crystals; massive; very hard, firm, sticky and plastic; common very fine roots; common very fine and fine tubular pores and few medium tubular pores; violently effervescent; moderately alkaline; abrupt smooth boundary.

IIC2—28 to 60 inches; pink (5YR 7/4) fine sand, light reddish brown (5YR 6/4) moist; single grain; loose dry or moist; nonsticky and nonplastic; few very fine and fine roots; many very fine and fine and few medium interstitial pores; strongly effervescent; moderately alkaline.

The profile dominantly has hue of 5YR when dry, but hue ranges from 2.5YR to 7.5YR. The hue of 7.5YR generally is in the deeper parts of the profile. The dominant texture is silty clay loam, but in some pedons there are strata of sand, sandy loam, or silty clay as much as 15 inches thick. Content of lime is variable, but it is generally higher in the finer textured layers. Fine salt and gypsum segregations can occur in any part of the profile, but they generally occur in the C horizon.

Weiser series

The Weiser series consist of deep, well drained soils on old dissected alluvial fans and on colluvial foothills. These soils formed in gravelly and cobbly alluvium derived mainly from limestone and some shale, quartzite, and chert. Slope is 15 to 30 percent.

Typical pedon of Weiser cobbly sandy loam, 15 to 30 percent slopes, about 2,500 feet south and 200 feet east of the northwest corner of sec. 25, T. 12 S., R. 65 E.:

A1—0 to 2 inches; pink (7.5YR 7/4) cobbly sandy loam, brown (7.5YR 4/4) moist; weak thick platy structure that parts with slight pressure to weak medium and fine subangular blocky and fine granular; slightly hard, very friable, nonsticky and nonplastic; few fine roots; many fine and medium vesicular pores; violently effervescent; moderately alkaline; abrupt smooth boundary.

C1—2 to 6 inches; pink (7.5YR 7/4) gravelly sandy loam, brown (7.5YR 5/4) moist; weak medium and fine granular structure; soft, very friable, nonsticky and nonplastic; few fine roots; many very fine interstitial pores and few fine tubular pores; 30 percent rock fragments; violently effervescent; moderately alkaline; clear wavy boundary.

C2ca—6 to 16 inches; pink (7.5YR 7/4) gravelly fine sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine interstitial pores; 55 percent rock fragments; common white (10YR 8/2) lime nodules; many lime-coated rock fragments; violently effervescent; moderately alkaline; clear wavy boundary.

C3ca—16 to 20 inches; pink (7.5YR 7/4) very gravelly fine sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine and fine interstitial pores; 80 percent rock fragments that have many pinkish white (7.5YR 8/2) lime crusts 1/8 to 1/3 inch thick; few lime nodules and lime-filled crevices between pebbles; violently effervescent; moderately alkaline; clear wavy boundary.

C4—20 to 50 inches; pink (7.5YR 7/4) very gravelly sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine and fine interstitial pores; 70 percent rock fragments; violently effervescent; moderately alkaline.

The calcic horizon is at a depth of 5 to 15 inches. It is 10 to 28 inches thick. It has hue of 7.5YR or 10YR. The 10- to 40-inch control section is fine sandy loam or sandy loam that is modified by gravel or cobbles, or both. Rock fragments, dominantly gravel, make up 55 to 80 percent of the control section; stones make up as much as 15 percent, cobbles make up as much as 25 percent, and gravel makes up as much as 60 percent. The A1 horizon has value of 6 or 7 when dry and 4 or 5 when moist, and it has chroma of 2 to 4. The calcic horizon has few to many lime concretions that are medium to very coarse. All rock fragments are coated with lime, at least on the underside. Few, very hard and firm, weakly cemented lenses less than 1 inch thick are in some pedons. The C horizon has value of 6 to 8 when dry and 5 or 6 when moist, and it has chroma of 2 to 4. Value of 8 when dry occurs only in the calcic horizon of some pedons.

Classification of the soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to the latest literature available (*6, 8*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In

this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 16, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Aridisol (meaning dry soil).

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Orthids (*Orth*, meaning true, plus *id*, from Aridisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Calciorthids (*Calc*, meaning lime, plus *orthid*, the suborder of Aridisols that have a true arid moisture regime).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Calciorthids.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is sandy, mixed, thermic Typic Calciorthids.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface layer or of the underlying layers, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim. An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	03.5
Low	3.5-5.0
Moderate	5.0-7.5
High	07.5

Badland. Steep or very steep, commonly nonstony barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Coarse textured (light textured) soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the bases of steep slopes.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave. Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. A delay in grazing until range plants have reached a specified stage of growth. Grazing is deferred in order to increase the vigor of forage and to allow desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drain-

age, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Excess alkali. Excess exchangeable sodium. The resulting poor physical properties restrict the growth of plants.

Excess salts. Excess water soluble salts. Excessive salts restrict the growth of most plants.

Fine textured (heavy textured) soil. Sandy clay, silty clay, and clay.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Gypsum. Hydrous calcium sulphate.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is

cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Leaching. The removal of soluble material from soil or other material by percolating water.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Moderately fine textured (moderately heavy textured) soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches

per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Phase, soil. A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the bases of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Piping. Moving water forms subsurface tunnels or pipelike cavities in the soil.

Poor outlets. Surface or subsurface drainage outlets difficult or expensive to install.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Range site. An area of range where climate, soil, and relief are sufficiently uniform to produce a distinct kind and amount of native vegetation.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline-alkali soil. A soil that contains a harmful concentration of salts and exchangeable sodium; contains harmful salts and is strongly alkaline; or contains harmful salts and exchangeable sodium and is very strongly alkaline. The salts, exchangeable sodium, and alkaline reaction are in the soil in such location that growth of most crop plants is less than normal.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake. The slow movement of water into the soil.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 milli-

meter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams emerging from hills or mountains and spreading sediments onto the lowland as a series of adjacent alluvial fans.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but the limited geographic soil area does not justify creation of a new series.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.
Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.
Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.
Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Well graded. Refers to a soil or soil material consisting of particles well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature[1]						Precipitation[1]				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[2]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	57.1	28.8	43.0	73	12	17	.39	.03	.65	2	.6
February	65.5	35.6	50.6	82	21	102	.40	.00	.73	1	.0
March	70.7	38.9	54.6	91	27	195	.70	.00	1.16	2	.0
April	77.0	43.1	60.0	90	30	300	.15	.00	.25	1	.0
May	89.2	52.7	71.0	106	39	651	.21	.00	.34	1	.0
June	99.4	60.7	80.1	115	46	903	.05	.00	.12	0	.0
July	105.0	68.0	86.5	115	54	1,132	.27	.00	.47	1	.0
August	102.2	67.3	84.7	114	52	1,076	.61	.00	1.07	2	.0
September	96.0	57.5	76.8	110	39	804	.20	.00	.34	1	.0
October	81.5	46.3	63.9	98	29	431	.32	.03	.53	1	.0
November	68.2	36.8	52.5	81	26	116	.48	.15	.73	2	.0
December	58.7	29.0	43.9	72	17	19	.33	.00	.61	1	.0
Year	80.9	47.1	64.0	116	11	5,746	4.11	3.83	4.82	15	.6

[1]Recorded in the period 1968-75 at Logandale, Nev.

[2]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (30° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature[1]		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	February 20	March 20	May 3
2 years in 10 later than--	February 13	March 10	April 21
5 years in 10 later than--	January 31	February 18	March 30
First freezing temperature in fall:			
1 year in 10 earlier than--	November 14	November 11	October 19
2 years in 10 earlier than--	November 23	November 18	October 26
5 years in 10 earlier than--	December 13	December 2	November 9

[1]Recorded in the period 1968-75 at Logandale, Nev.

TABLE 3.--GROWING SEASON LENGTH

Probability	Daily minimum temperature during growing season[1]		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	268	243	180
8 years in 10	284	259	195
5 years in 10	320	293	224
2 years in 10	>365	>365	252
1 year in 10	>365	>365	267

[1]Recorded in the period 1968-75 at Logandale, Nev.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Nevada		Arizona	Total--	
		Clark County	Lincoln County	Mohave County	Area	Extent
		Acres	Acres	Acres	Acres	Pct
Ad	Alluvial land	4,106	0	629	4,735	0.4
Ae	Anthony fine sandy loam	238	0	0	238	**
Af	Anthony fine sandy loam, gravelly substratum	548	0	0	548	0.1
Ah	Anthony fine sandy loam, water table	268	0	0	268	**
AMC*	Arada fine sand, 2 to 8 percent slopes	8,964	0	3,303	12,267	1.1
AOB*	Arada fine sand, gravelly substratum, 0 to 4 percent slopes	6,807	0	0	6,807	0.6
ASC*	Arada fine sand, hardpan variant, 2 to 8 percent slopes	6,909	0	1,607	8,516	0.8
ATA*	Arizo fine sand, 0 to 2 percent slopes	525	0	0	525	**
AVB*	Arizo gravelly fine sand, 2 to 4 percent slopes	4,997	378	0	5,375	0.5
AXC*	Arizo very gravelly loamy sand, 2 to 8 percent slopes	1,907	363	495	2,765	0.3
AYD*	Arrolime gravelly silt loam, 2 to 15 percent slopes	4,237	0	0	4,237	0.4
BD*	Badland	139,941	13,745	4,736	158,422	15.0
BFD*	Bard gravelly fine sand, 4 to 15 percent slopes	4,420	0	0	4,420	0.4
BHC*	Bard gravelly fine sandy loam, 2 to 8 percent slopes	77,410	12,261	204	89,875	8.5
BMD*	Bard very gravelly fine sandy loam, 2 to 15 percent slopes	6,016	0	132	6,148	0.6
BNB*	Bard very stony loam, 2 to 4 percent slopes	16,716	0	0	16,716	1.6
BOB*	Bard-Rough broken land association, gently sloping	22,650	0	0	22,650	2.1
BRB*	Bard-Tonopah association, gently sloping	12,052	0	0	12,052	1.1
BTC*	Bitter Spring-Arizo association, moderately sloping	29,936	0	12,864	42,800	4.0
Bu	Black Butte silt loam	1,492	0	321	1,813	0.2
Bv	Black Butte silt loam, water table	214	0	0	214	**
Bw	Bluepoint loamy fine sand	507	0	0	507	**
By	Bluepoint fine sandy loam, strongly saline	435	0	0	435	**
Ca	Calico fine sandy loam	329	0	0	329	**
Cc	Calico fine sandy loam, drained	1,751	0	0	1,751	0.2
Cd	Calico fine sandy loam, strongly saline	250	0	0	250	**
Cm	Calico clay loam	212	0	0	212	**
Cn	Calico loamy fine sand, coarse variant, drained	331	0	0	331	**
Co	Calico loamy fine sand, coarse variant, strongly saline	479	0	0	479	**
CTC*	Colorock-Tonopah association, moderately sloping	73,602	5,836	0	79,438	7.5
CYB*	Crystal Springs gravelly sandy loam, 2 to 4 percent slopes	445	555	0	1,000	0.1
Ea	Eastland gravelly sandy loam	1,710	0	350	2,060	0.2
FLC*	Flattop gravelly clay loam, 2 to 8 percent slopes	16,408	4,314	0	20,722	1.9
GAE*	Garr-Rock outcrop complex, 15 to 50 percent slopes	10,933	0	0	10,933	1.0
Gd	Gila fine sand	1,328	0	0	1,328	0.1
Ge	Gila loam	1,247	0	86	1,333	0.1
Gf	Gila loam, strongly saline	2,299	33	0	2,332	0.2
Gm	Gila loam, water table	220	0	0	220	**
Gn	Gila loam, water table, strongly saline	427	0	0	427	**
Go	Glendale fine sand	1,160	0	0	1,160	0.1
Gr	Glendale loam	3,112	0	0	3,112	0.3
Gs	Glendale loam, strongly saline	6,685	0	0	6,685	0.6
Gv	Grapevine loam	3,787	0	0	3,787	0.4
Ir	Ireteba loam	377	0	0	377	**
It	Ireteba loam, overflow	3,201	0	0	3,201	0.3
La	Land loamy fine sand	188	0	0	188	**
Lc	Land silty clay loam	418	0	0	418	**
Ld	Land silty clay loam, wet	672	33	0	705	0.1
MMB*	Mormon Mesa loamy fine sand, 0 to 4 percent slopes	11,922	0	0	11,922	1.1
MOB*	Mormon Mesa fine sandy loam, 0 to 8 percent slopes	100,999	7,417	10,076	118,492	11.3
NAC*	Nickel-Arizo association, rolling	50,736	0	0	50,736	4.7
Oc	Overton silty clay	1,047	0	0	1,047	0.1
Oe	Overton silty clay, slightly saline	437	0	0	437	**
On	Overton silty clay, strongly saline	161	0	0	161	**
Or	Overton clay, overwash, saline	226	0	0	226	**
Os	Overton silt loam, loamy variant, slightly saline	503	0	0	503	**
Ot	Overton silt loam, loamy variant, strongly saline	84	0	0	84	**
PL*	Playas	740	0	0	740	0.1
PME*	Pulsipher-Rock outcrop complex, 15 to 30 percent slopes	624	0	0	624	0.1
PPE*	Pulsipher association, hilly	558	0	0	558	0.1
PRE*	Pulsipher gravelly clay loam, fine variant, 15 to 30 percent slopes	0	412	0	412	**
Re*	Riverwash	1,394	0	446	1,840	0.2
RME*	Rock land-Moapa association, hilly	12,303	0	0	12,303	1.2

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Nevada		Arizona	Total--	
		Clark County	Lincoln County	Mohave County	Area	Extent
		Acres	Acres	Acres	Acres	Pct
RTF*	Rock land-St. Thomas association, very steep	163,947	27,449	0	191,396	18.1
SP*	Spring silty clay loam	848	0	0	848	0.1
Tb	Tobler fine sandy loam	404	0	0	404	**
Tc	Tobler fine sandy loam, strongly saline	198	0	0	198	**
Td	Tobler silt loam, wet	368	0	0	368	**
Te	Tobler clay, strongly saline	133	0	0	133	**
THB*	Tonopah gravelly sandy loam, 0 to 4 percent slopes	34,058	1,475	186	35,719	3.3
TMD*	Tonopah very gravelly sandy loam, 4 to 15 percent slopes	14,451	3,591	524	18,566	1.7
TnA	Toquop fine sand, 0 to 2 percent slopes	3,970	101	159	4,230	0.4
TnB	Toquop fine sand, 2 to 8 percent slopes	8,070	10	36	8,116	0.8
TsA	Toquop fine sand, water table, 0 to 2 percent slopes	0	0	484	484	**
TtA	Toquop fine sandy loam, 0 to 2 percent slopes	1,144	34	471	1,649	0.2
TuA	Toquop fine sandy loam, water table, 0 to 2 percent slopes	380	0	142	522	**
TvA	Toquop silty clay loam, strongly saline, 0 to 2 percent slopes	710	0	0	710	0.1
Vd	Vinton fine sandy loam	0	0	297	297	**
VEF*	Virgin Peak-Rock land association, very steep	26,050	0	0	26,050	2.4
Vg	Virgin River silty clay	1,733	0	0	1,733	0.2
Vn	Virgin River silty clay, strongly saline	885	0	0	885	0.1
Vr	Virgin River silty clay loam, wet variant	494	0	0	494	**
WEE*	Weiser cobbly sandy loam, 15 to 30 percent slopes	19,530	6,088	0	25,618	2.4
	Water	5,000	0	0	5,000	0.5
	Total	946,973	84,095	37,548	1,068,616	100.0

* See map unit description for composition and behavior of the map unit.
** Less than 0.1 percent.

TABLE 5--YIELDS PER ACRE OF CROPS AND PASTURE FOR IRRIGATED CROPLAND

[All yields were estimated for a high level of management in 1975. Absence of a yield figure indicates the crop is seldom grown or is not suited]

Soil name and map symbol	Alfalfa hay	Pasture	Barley	Wheat
	Ton	AUM*	Bu	Bu
Ae---------- Anthony	8	18	75	100
Bu, Bv---------- Black Butte	6	12	75	100
Bw---------- Bluepoint	7	15	50	70
Ca---------- Calico	5	12	50	100
Cc---------- Calico	8	14	75	100
Cm---------- Calico	5	12	50	100
Ea---------- Eastland	8	12	75	---
Gm---------- Gila	8	16	75	---
Oc---------- Overton	8	12	75	---
Oe---------- Overton	6	12	75	100
Os---------- Overton Variant	6	12	65	---
Tb---------- Tobler	8	20	90	---
Td---------- Tobler	6	12	80	---
TtA, TuA---------- Toquop	6	12	65	100
Vd---------- Vinton	8	12	70	100
Vg---------- Virgin River	6	12	---	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for a period of 30 days.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Soils not listed do not support rangeland vegetation suited to grazing]

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Ae Anthony	Loamy Bottom, Saline	Favorable	1,100	Alkali sacaton	25
		Normal	600	Inland saltgrass	10
		Unfavorable	300	Big saltbush	10
				Fourwing saltbush	10
				Rush	5
				Arrowweed	5
Af Anthony	Arid Limy Upland	Favorable	375	Creosotebush	30
		Normal	230	White bursage	15
		Unfavorable	100	Big galleta	5
				Indian ricegrass	5
Ah Anthony	Loamy Bottom, Saline	Favorable	1,300	Alkali sacaton	20
		Normal	600	Inland saltgrass	15
		Unfavorable	400	Big saltbush	10
				Rush	10
				Fourwing saltbush	5
				Arrowweed	5
AMC*, AOB* Arada	Arid Sandy Limy Upland	Favorable	450	Creosotebush	18
		Normal	320	Big galleta	12
		Unfavorable	240	White bursage	10
				Indian ricegrass	7
				Range ratany	5
				Joshua-tree	5
ASC* Arada Variant	Arid Sandy Limy Upland	Favorable	425	Creosotebush	15
		Normal	300	Big galleta	10
		Unfavorable	225	White bursage	8
				Indian ricegrass	6
				Joshua-tree	5
ATA*, AVB*, AXC* Arizo	Wash	Favorable	125	Creosotebush	20
		Normal	100	White bursage	8
		Unfavorable	50	Big galleta	7
				Desertwillow	5
				Acacia	5
				Mesquite	5
				Indian ricegrass	5
				White burrobrush	5
				Fremont dalea	5
AYD* Arrolime	Arid Limy Upland	Favorable	250	Creosotebush	25
		Normal	100	White bursage	10
		Unfavorable	75	Fremont dalea	8
				Desertholly	5
				Big galleta	5
BFD*, BHC*, BMD* Bard	Arid Limy Upland	Favorable	300	Creosotebush	20
		Normal	200	White bursage	10
		Unfavorable	75	Big galleta	7
				Indian ricegrass	5
BNB* Bard	Arid Limy Upland	Favorable	280	Creosotebush	25
		Normal	175	White bursage	10
		Unfavorable	100	Big galleta	8
				Indian ricegrass	7
BOB*: Bard	Arid Limy Upland	Favorable	300	Creosotebush	20
		Normal	200	White bursage	10
		Unfavorable	75	Big galleta	7
				Indian ricegrass	5
Rough broken land.					

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
BRB*:					
Bard	Arid Limy Upland	Favorable	280	Creosotebush	25
		Normal	175	White bursage	10
		Unfavorable	100	Big galleta	8
				Indian ricegrass	7
Tonopah	Arid Limy Upland	Favorable	325	Creosotebush	22
		Normal	240	Big galleta	10
		Unfavorable	90	White bursage	10
				Indian ricegrass	6
BTC*:					
Bitter Spring	Arid Limy Upland	Favorable	250	Creosotebush	20
		Normal	170	White bursage	10
		Unfavorable	100	Big galleta	8
				Indian ricegrass	5
				Pricklypear	5
Arizo	Wash	Favorable	125	Creosotebush	20
		Normal	100	White bursage	8
		Unfavorable	50	Big galleta	7
				Desertwillow	5
				Acacia	5
				Mesquite	5
				Indian ricegrass	5
				White burrobrush	5
				Fremont dalea	5
By Bluepoint	Arid Limy Upland	Favorable	375	Creosotebush	15
		Normal	225	White bursage	10
		Unfavorable	100	Big galleta	10
				Claretcup cactus	7
				Yucca	5
				Indian ricegrass	5
				Desert needlegrass	5
Ca Calico	Loamy Bottom, Saline	Favorable	1,200	Alkali sacaton	25
		Normal	650	Inland saltgrass	12
		Unfavorable	400	Big galleta	5
				Fourwing saltbush	5
				Big saltbush	5
				Arrowweed pluchea	5
				Rabbitbrush	5
				Mesquite	5
				Seepwillow baccharis	5
Cc Calico	Loamy Bottom, Saline	Favorable	1,250	Alkali sacaton	20
		Normal	750	Inland saltgrass	10
		Unfavorable	400	Big saltbush	10
				Arrowweed pluchea	10
				Fourwing saltbush	8
				Mesquite	5
				Rush	5
Cd Calico	Loamy Bottom, Saline	Favorable	1,200	Alkali sacaton	25
		Normal	650	Inland saltgrass	12
		Unfavorable	400	Big galleta	5
				Fourwing saltbush	5
				Big saltbush	5
				Arrowweed pluchea	5
				Rabbitbrush	5
				Mesquite	5
				Seepwillow baccharis	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Cn---------- Calico Variant	Loamy Bottom, Saline----------	Favorable	1,300	Alkali sacaton----------	25
		Normal	600	Inland saltgrass----------	15
		Unfavorable	470	Big saltbush----------	5
				Fourwing saltbush----------	5
				Mesquite----------	5
				Arrowweed pluchea----------	5
				Seepwillow baccharis----------	5
Co---------- Calico Variant	Loamy Bottom, Saline----------	Favorable	1,300	Alkali sacaton----------	25
		Normal	700	Inland saltgrass----------	15
		Unfavorable	450	Arrowweed pluchea----------	5
				Mesquite----------	5
				Giant reed----------	5
				Rush----------	5
CTC*:					
Colorock----------	Arid Limy Upland----------	Favorable	250	Creosotebush----------	25
		Normal	115	White bursage----------	10
		Unfavorable	80	Big galleta----------	5
				Indian ricegrass----------	5
Tonopah----------	Arid Limy Upland----------	Favorable	325	Creosotebush----------	22
		Normal	240	Big galleta----------	10
		Unfavorable	90	White bursage----------	10
				Indian ricegrass----------	6
CYB*---------- Crystal Springs	Semi Arid Upland (Blackbrush)	Favorable	350	Blackbrush----------	40
		Normal	200	Creosotebush----------	5
		Unfavorable	125	White bursage----------	5
				Mohave yucca----------	5
FLC*---------- Flattop	Arid Limy Upland----------	Favorable	225	Creosotebush----------	25
		Normal	135	White bursage----------	10
		Unfavorable	90	Big galleta----------	6
				Indian ricegrass----------	5
GAE*:					
Garr----------	Arid Limy Hill----------	Favorable	325	Creosotebush----------	30
		Normal	200	White bursage----------	10
		Unfavorable	100	Mohave yucca----------	10
				Pricklypear----------	5
Rock outcrop.					
Gd---------- Gila	Arid Limy Upland----------	Favorable	375	Creosotebush----------	30
		Normal	230	White bursage----------	10
		Unfavorable	150	Big galleta----------	5
				Indian ricegrass----------	5
				Fourwing saltbush----------	5
Gf---------- Gila	Arid Limy Upland----------	Favorable	375	Creosotebush----------	30
		Normal	230	White bursage----------	10
		Unfavorable	150	Big galleta----------	5
				Indian ricegrass----------	5
				Fourwing saltbush----------	5
Gn---------- Gila	Loamy Bottom, Saline----------	Favorable	1,300	Alkali sacaton----------	20
		Normal	650	Inland saltgrass----------	15
		Unfavorable	400	Big saltbush----------	10
				Rush----------	10
				Fourwing saltbush----------	7
				Giant reed----------	5
				Mesquite----------	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight Lb/acre		Pct
Go, Gr---------- Glendale	Arid Limy Upland----------	Favorable	400	Creosotebush----------	20
		Normal	240	White bursage----------	10
		Unfavorable	100	Big galleta----------	10
				Indian ricegrass----------	5
				Ephedra----------	5
				Yucca----------	5
				Fourwing saltbush----------	5
Gs---------- Glendale	Arid Limy Upland----------	Favorable	400	Creosotebush----------	20
		Normal	240	Big galleta----------	10
		Unfavorable	100	White bursage----------	10
				Indian ricegrass----------	5
Gv---------- Grapevine	Arid Limy Upland----------	Favorable	325	Creosotebush----------	30
		Normal	200	White bursage----------	10
		Unfavorable	100	Shadscale----------	10
				Catclaw----------	5
				Big galleta----------	5
Ir, It---------- Ireteba	Arid Limy Upland----------	Favorable	325	Creosotebush----------	25
		Normal	200	White bursage----------	10
		Unfavorable	100	Big galleta----------	10
				Indian ricegrass----------	5
La, Lc---------- Land	Loamy Bottom, Saline----------	Favorable	1,000	Alkali sacaton----------	15
		Normal	575	Inland saltgrass----------	10
		Unfavorable	400	Iodinebush----------	5
				Torrey seepweed----------	5
				Big saltbush----------	5
				Desertholly----------	5
				Fourwing saltbush----------	5
				Mesquite----------	5
Ld---------- Land	Loamy Bottom, Saline----------	Favorable	1,000	Alkali sacaton----------	20
		Normal	580	Inland saltgrass----------	15
		Unfavorable	400	Rush----------	5
				Giant reed----------	5
				Mesquite----------	5
				Big saltbush----------	5
				Iodinebush----------	5
MMB*, MOB*--------- Mormon Mesa	Arid Limy Upland----------	Favorable	325	Creosotebush----------	25
		Normal	230	White bursage----------	10
		Unfavorable	140	Big galleta----------	8
				Indian ricegrass----------	5
NAC*:					
Nickel----------	Arid Limy Upland----------	Favorable	285	Creosotebush----------	25
		Normal	165	White bursage----------	10
		Unfavorable	85	Mohave yucca----------	5
				Nevada ephedra----------	5
				Big galleta----------	5
				Indian ricegrass----------	5
				Filaree----------	5
				Fluffgrass----------	5
Arizo----------	Wash----------	Favorable	125	Creosotebush----------	20
		Normal	100	White bursage----------	8
		Unfavorable	50	Big galleta----------	7
				Desertwillow----------	5
				Acacia----------	5
				Mesquite----------	5
				Indian ricegrass----------	5
				White burrobrush----------	5
				Fremont dalea----------	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
NAC*:					
Cave	Arid Limy Upland	Favorable	400	Creosotebush	30
		Normal	300	White bursage	15
		Unfavorable	100	Mohave yucca	5
				Nevada ephedra	5
				Filaree	5
On, Or	Loamy Bottom, Saline	Favorable	1,300	Alkali sacaton	20
Overton		Normal	650	Inland saltgrass	8
		Unfavorable	400	Big saltbush	6
				Arrowweed pluchea	6
				Big galleta	5
				Mesquite	5
				Fourwing saltbush	5
Ot	Lomay Bottom, Saline	Favorable	1,300	Alkali sacaton	20
Overton Variant		Normal	700	Inland saltgrass	15
		Unfavorable	450	Big saltbush	8
				Arrowweed pluchea	7
				Mesquite	5
				Fourwing saltbush	5
PME*:					
Pulsipher	Semi Arid Hill (Blackbrush)	Favorable	230	Blackbrush	30
		Normal	130	Yucca	8
		Unfavorable	90	Ephedra	6
				White burrobrush	5
				Big galleta	5
				Needleandthread	5
Rock outcrop.					
PPE*:					
Pulsipher	Semi Arid Hill (Blackbrush)	Favorable	230	Blackbrush	30
		Normal	130	Yucca	8
		Unfavorable	90	Ephedra	6
				White burrobrush	5
				Big galleta	5
				Needleandthread	5
Pulsipher Variant	Semi Arid Hill (Blackbrush)	Favorable	230	Blackbrush	35
		Normal	130	Yucca	8
		Unfavorable	90	White burrobrush	5
				Ephedra	5
				Big galleta	5
PRE*	Semi Arid Hill (Blackbrush)	Favorable	230	Blackbrush	35
Pulsipher Variant		Normal	130	Yucca	8
		Unfavorable	90	White burrobrush	5
				Ephedra	5
				Big galleta	5
RME*:					
Rock land.					
Moapa	Arid Sandy Limy Upland	Favorable	425	Creosotebush	20
		Normal	250	White bursage	10
		Unfavorable	180	Big galleta	8
				Indian ricegrass	6
				Joshua-tree	5
RTF*:					
Rock land.					

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
RTF*:					
St. Thomas	Arid Limy Hill	Favorable	175	Creosotebush	20
		Normal	125	White bursage	8
		Unfavorable	90	Big galleta	7
				Range ratany	5
				White brittlebush	5
				Indian ricegrass	5
SP*	Gypland	Favorable	70	Fremont dalea	40
Spring		Normal	50	Shadscale	25
		Unfavorable	10	Desertholly	10
				Torrey seepweed	10
Tc	Loamy Bottom, Saline	Favorable	1,300	Alkali sacaton	25
Tobler		Normal	700	Inland saltgrass	15
		Unfavorable	400	Rush	10
				Arrowweed pluchea	8
				Big saltbush	5
				Fourwing saltbush	5
				Giant reed	5
Te	Loamy Bottom, Saline	Favorable	1,300	Alkali sacaton	25
Tobler		Normal	700	Inland saltgrass	15
		Unfavorable	400	Rush	10
				Arrowweed pluchea	8
				Big saltbush	5
				Fourwing saltbush	5
				Giant reed	5
THB*, TMD*	Arid Limy Upland	Favorable	325	Creosotebush	22
Tonopah		Normal	240	Big galleta	10
		Unfavorable	90	White bursage	10
				Indian ricegrass	6
TnA	Loamy Bottom, Saline	Favorable	1,300	Alkali sacaton	20
Toquop		Normal	750	Inland saltgrass	15
		Unfavorable	500	Big saltbush	10
				Fourwing saltbush	5
				Torrey seepweed	5
				Arrowweed pluchea	5
TnB	Arid Limy Upland	Favorable	325	Creosotebush	25
Toquop		Normal	200	White bursage	10
		Unfavorable	100	Big galleta	10
				Indian ricegrass	5
				Fourwing saltbush	5
TsA	Loamy Bottom, Saline	Favorable	1,300	Alkali sacaton	20
Toquop		Normal	700	Inland saltgrass	15
		Unfavorable	580	Big saltbush	10
				Fourwing saltbush	5
				Screwbean mesquite	5
				Rush	5
				Common reed	5
TtA	Loamy Bottom, Saline	Favorable	1,300	Alkali sacaton	20
Toquop		Normal	750	Inland saltgrass	15
		Unfavorable	500	Big saltbush	10
				Fourwing saltbush	5
				Torrey seepweed	5
				Arrowweed pluchea	5
TuA	Loamy Bottom, Saline	Favorable	1,300	Alkali sacaton	20
Toquop		Normal	700	Inland saltgrass	15
		Unfavorable	580	Big saltbush	10
				Fourwing saltbush	5
				Screwbean mesquite	5
				Rush	5
				Common reed	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
TvA Toquop	Loamy Bottom, Saline	Favorable Normal Unfavorable	1,100 650 500	Inland saltgrass Alkali sacaton Big saltbush Torrey seepweed Screwbean mesquite	20 15 10 5 5
Vd Vinton	Floodplain	Favorable Normal Unfavorable	700 480 300	Big galleta Creosotebush Mesquite Indian ricegrass White bursage	30 20 5 5 5
Rock land.					
Vn Virgin River	Loamy Bottom, Saline	Favorable Normal Unfavorable	1,300 680 500	Alkali sacaton Inland saltgrass Big saltbush Rush Giant reed Fourwing saltbush Screwbean mesquite Wolfberry	20 15 10 5 5 5 5 5
Vr Virgin River Variant	Loamy Bottom, Saline	Favorable Normal Unfavorable	1,300 700 490	Alkali sacaton Inland saltgrass Screwbean mesquite Fourwing saltbush Big saltbush Torrey seepweed Giant reed	20 15 5 5 5 5 5
WEE* Weiser	Arid Limy Upland	Favorable Normal Unfavorable	260 160 80	Creosotebush White bursage Big galleta Indian ricegrass Range ratany Ephedra	20 10 7 5 5 5

* See map unit description for the composition and behavior of the map unit.

TABLE 7.--BUILDING SITE DEVELOPMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Ad*. Alluvial land					
Ae---------- Anthony	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength.
Af---------- Anthony	Severe: floods, small stones.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Ah---------- Anthony	Moderate: floods, wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength.
AMC*---------- Arada	Severe: small stones, cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Slight.
AOB*---------- Arada	Severe: small stones, cutbanks cave.	Slight----------	Slight----------	Slight----------	Slight.
ASC*---------- Arada Variant	Severe: cemented pan, cutbanks cave.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: slope, cemented pan.	Moderate: cemented pan.
ATA*, AVB*, AXC*-- Arizo	Severe: floods, small stones, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
AYD*---------- Arrolime	Severe: small stones.	Severe: floods.	Severe: floods.	Severe: floods, slope.	Moderate: floods, slope.
BD*. Badland					
BFD*---------- Bard	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan, slope.	Severe: cemented pan.
BHC*---------- Bard	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.
BMD*---------- Bard	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan, slope.	Severe: cemented pan.
BNB*---------- Bard	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.
BOB*: Bard----------	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.
Rough broken land.					

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
BRB*:					
Bard	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.
Tonopah	Severe: small stones, too sandy.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
BTC*:					
Bitter Spring	Severe: small stones.	Slight	Slight	Moderate: slope.	Slight.
Arizo	Severe: floods, small stones, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Bu Black Butte	Severe: too sandy, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, shrink-swell, low strength.
Bv Black Butte	Severe: too sandy, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, wetness, low strength.
Bw, By Bluepoint	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Ca Calico	Severe: floods, cutbanks cave.	Severe: floods, low strength, shrink-swell.	Severe: floods, low strength, shrink-swell.	Severe: floods, low strength, shrink-swell.	Severe: floods.
Cc Calico	Severe: floods.	Severe: floods, low strength, shrink-swell.	Severe: floods, low strength, shrink-swell.	Severe: floods, low strength, shrink-swell.	Severe: floods.
Cd, Cm Calico	Severe: floods, cutbanks cave.	Severe: floods, low strength, shrink-swell.	Severe: floods, low strength, shrink-swell.	Severe: floods, low strength, shrink-swell.	Severe: floods.
Cn, Co Calico Variant	Severe: floods.	Severe: floods.	Severe: floods, shrink-swell, low strength.	Severe: floods.	Severe: floods.
CTC*:					
Colorock	Severe: cemented pan, small stones.	Severe: cemented pan, floods.	Severe: cemented pan, floods.	Severe: cemented pan, floods.	Severe: cemented pan.
Tonopah	Severe: small stones, too sandy.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
CYB* Crystal Springs	Severe: cemented pan.	Severe: cemented pan, floods.	Severe: cemented pan, floods.	Severe: cemented pan, floods.	Severe: cemented pan.
Ea Eastland	Severe: small stones, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
FLC*---------- Flattop	Severe: small stones.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
GAE*: Garr----------	Severe: slope, small stones, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Rock outcrop.					
Gd, Ge, Gf, Gm, Gn---------- Gila	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Go, Gr, Gs-------- Glendale	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Gv---------- Grapevine	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength.
Ir---------- Ireteba	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
It---------- Ireteba	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
La---------- Land	Moderate: floods, wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength.
Lc---------- Land	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, low strength.
Ld---------- Land	Severe: floods, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods, wetness, low strength.
MMB*, MOB*-------- Mormon Mesa	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.
NAC*: Nickel----------	Severe: slope, small stones.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Arizo----------	Severe: floods, small stones, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Cave----------	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: slope, cemented pan.	Severe: cemented pan.
Oc---------- Overton	Severe: too clayey.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: shrink-swell, low strength.
Oe, On---------- Overton	Severe: too clayey.	Severe: low strength, floods, shrink-swell.	Severe: low strength, floods, shrink-swell.	Severe: low strength, floods, shrink-swell.	Severe: low strength, shrink-swell.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Or Overton	Severe: wetness, too clayey.	Severe: wetness, low strength, floods.	Severe: wetness, low strength, floods.	Severe: wetness, low strength, floods.	Severe: wetness, low strength, shrink-swell.
Os Overton Variant	Severe: wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: wetness, low strength.
Ot Overton Variant	Severe: wetness, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
PL*. Playas					
PME*: Pulsipher	Severe: slope, depth to rock, small stones.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Rock outcrop.					
PPE*: Pulsipher	Severe: slope, depth to rock, small stones.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Pulsipher Variant	Severe: slope, too clayey, depth to rock.	Severe: slope, shrink-swell, depth to rock.	Severe: slope, shrink-swell, depth to rock.	Severe: slope, shrink-swell, depth to rock.	Severe: slope, depth to rock, shrink-swell.
PRE* Pulsipher Variant	Severe: slope, too clayey, depth to rock.	Severe: slope, shrink-swell, depth to rock.	Severe: slope, shrink-swell, depth to rock.	Severe: slope, shrink-swell, depth to rock.	Severe: slope, depth to rock, shrink-swell.
Re*. Riverwash					
RME*: Rock land.					
Moapa	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock.
RTF*: Rock land.					
St. Thomas	Severe: slope, depth to rock, small stones.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
SP* Spring	Moderate: floods, too clayey.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength.
Tb Tobler	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Tc Tobler	Severe: floods, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods, wetness.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Td---------- Tobler	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Te---------- Tobler	Severe: floods, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods, wetness, low strength.
THB*---------- Tonopah	Severe: small stones, too sandy.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
TMD*---------- Tonopah	Severe: small stones, too sandy.	Severe: floods.	Severe: floods.	Severe: floods, slope.	Moderate: floods, slope.
TnA, TnB, TsA, TtA, TuA, TvA---- Toquop	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Vd---------- Vinton	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
VEF*: Virgin Peak------	Severe: slope, small stones, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Rock land.					
Vg, Vn---------- Virgin River	Severe: floods.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.
Vr---------- Virgin River Variant	Severe: wetness, floods, cutbanks cave.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.
WEE*---------- Weiser	Severe: slope, small stones.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

* See map unit description for the composition and behavior of the map unit.

TABLE 8.--SANITARY FACILITIES

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms used to rate soils. Absence of an entry means soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ad*. Alluvial land					
Ae Anthony	Moderate: floods.	Severe: seepage, floods.	Moderate: floods.	Moderate: floods.	Good.
Af Anthony	Severe: floods.	Severe: seepage, small stones, floods.	Severe: floods.	Severe: floods.	Fair: small stones.
Ah Anthony	Severe: floods, wetness.	Severe: seepage, floods.	Severe: wetness.	Moderate: floods, wetness.	Good.
AMC*, AOB* Arada	Slight	Severe: seepage.	Severe: too sandy.	Slight	Poor: too sandy.
ASC* Arada Variant	Severe: cemented pan.	Severe: cemented pan, seepage.	Severe: cemented pan, too sandy.	Slight	Poor: too sandy, thin layer, area reclaim.
ATA*, AVB*, AXC* Arizo	Severe: floods.	Severe: seepage, floods.	Severe: floods, too sandy.	Severe: floods.	Poor: small stones.
AYD* Arrolime	Severe: percs slowly.	Severe: floods, slope, small stones.	Moderate: too clayey, floods.	Moderate: floods, slope.	Poor: small stones.
BD*. Badland					
BFD* Bard	Severe: cemented pan.	Severe: cemented pan, seepage, slope.	Severe: cemented pan.	Moderate: slope.	Poor: thin layer, area reclaim.
BHC* Bard	Severe: cemented pan.	Severe: cemented pan, seepage.	Severe: cemented pan.	Slight	Poor: thin layer, area reclaim.
BMD* Bard	Severe: cemented pan.	Severe: cemented pan, seepage, slope.	Severe: cemented pan.	Moderate: slope.	Poor: thin layer, area reclaim.
BNB* Bard	Severe: cemented pan.	Severe: cemented pan, seepage, small stones.	Severe: cemented pan.	Slight	Poor: thin layer, large stones, area reclaim.
BOB*: Bard	Severe: cemented pan.	Severe: cemented pan, seepage.	Severe: cemented pan.	Slight	Poor: thin layer, area reclaim.
Rough broken land.					

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BRB*:					
Bard	Severe: cemented pan.	Severe: cemented pan, seepage, small stones.	Severe: cemented pan.	Slight	Poor: thin layer, large stones, area reclaim.
Tonopah	Moderate: floods.	Severe: seepage, small stones, floods.	Severe: too sandy.	Moderate: floods.	Poor: small stones, too sandy.
BTC*:					
Bitter Spring	Slight	Severe: seepage, small stones.	Slight	Slight	Poor: small stones.
Arizo	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage, too sandy.	Severe: floods, seepage.	Poor: small stones.
Bu Black Butte	Moderate: floods.	Severe: seepage, floods.	Severe: too sandy.	Moderate: floods.	Poor: too sandy.
Bv Black Butte	Moderate: wetness, floods.	Severe: seepage.	Severe: wetness, too sandy, seepage.	Moderate: floods, wetness, seepage.	Poor: too sandy.
Bw Bluepoint	Moderate: floods.	Severe: seepage.	Moderate: floods, too sandy.	Moderate: floods.	Fair: too sandy.
By Bluepoint	Moderate: floods, wetness.	Severe: seepage.	Severe: wetness.	Moderate: floods, wetness.	Fair: too sandy.
Ca Calico	Severe: floods, percs slowly, wetness.	Severe: floods, seepage, wetness.	Severe: wetness, floods, seepage.	Severe: floods, wetness, seepage.	Fair: too clayey, wetness.
Cc Calico	Severe: percs slowly, floods.	Severe: floods, seepage.	Severe: floods.	Severe: floods.	Fair: too clayey.
Cd, Cm Calico	Severe: floods, percs slowly, wetness.	Severe: floods, seepage, wetness.	Severe: wetness, floods, seepage.	Severe: floods, wetness, seepage.	Fair: too clayey, wetness.
Cn Calico Variant	Severe: percs slowly, floods.	Severe: floods, seepage.	Severe: floods, too clayey, seepage.	Severe: floods, seepage.	Fair: too clayey.
Co Calico Variant	Severe: percs slowly, wetness, floods.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Severe: floods, wetness, seepage.	Fair: too clayey, wetness.
CTC*:					
Colorock	Severe: cemented pan.	Severe: cemented pan, floods.	Severe: cemented pan, small stones.	Moderate: floods.	Poor: area reclaim, thin layer, small stones.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CTC*: Tonopah	Moderate: floods.	Severe: seepage, small stones, floods.	Severe: too sandy.	Moderate: floods.	Poor: small stones, too sandy.
CYB*: Crystal Springs	Severe: cemented pan.	Severe: cemented pan, floods.	Severe: cemented pan.	Moderate: floods.	Poor: thin layer, area reclaim.
Ea: Eastland	Moderate: floods.	Severe: floods, seepage, small stones.	Moderate: floods.	Moderate: floods.	Poor: small stones.
FLC*: Flattop	Severe: cemented pan.	Severe: seepage, floods.	Severe: cemented pan.	Moderate: floods.	Poor: small stones, thin layer, area reclaim.
GAE*: Garr	Severe: slope, depth to rock.	Severe: depth to rock, slope, small stones.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope, thin layer, small stones.
Rock outcrop.					
Gd, Ge, Gf: Gila	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
Gm, Gn: Gila	Severe: floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Good.
Go, Gr, Gs: Glendale	Severe: percs slowly, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
Gv: Grapevine	Moderate: percs slowly, floods.	Severe: floods.	Moderate: floods.	Moderate: floods.	Fair: too clayey.
Ir: Ireteba	Moderate: percs slowly, floods.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
It: Ireteba	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
La: Land	Severe: percs slowly.	Severe: floods.	Severe: wetness.	Moderate: floods.	Fair: too clayey.
Lc: Land	Severe: percs slowly, floods.	Severe: floods.	Severe: wetness, floods.	Severe: floods.	Fair: too clayey.
Ld: Land	Severe: percs slowly, wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods.	Fair: wetness.
MMB*, MOB*: Mormon Mesa	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight	Poor: thin layer, area reclaim.
NAC*: Nickel	Severe: slope, percs slowly.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.	Poor: slope, small stones.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
NAC*:					
Arizo	Severe: floods.	Severe: seepage, floods.	Severe: floods, too sandy.	Severe: floods.	Poor: small stones.
Cave	Severe: cemented pan.	Severe: slope, cemented pan.	Severe: cemented pan.	Moderate: slope.	Poor: thin layer, area reclaim.
Oc	Severe: percs slowly, wetness.	Severe: floods, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey.
Overton					
Oe, On	Severe: percs slowly, wetness.	Severe: floods, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey.
Overton					
Or	Severe: percs slowly, wetness.	Severe: floods, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey.
Overton					
Os	Severe: wetness.	Severe: floods, wetness, seepage.	Severe: wetness.	Moderate: floods, wetness.	Fair: wetness.
Overton Variant					
Ot	Severe: wetness, floods.	Severe: floods, wetness, seepage.	Severe: floods, wetness.	Severe: floods.	Fair: wetness.
Overton Variant					
PL*.					
Playas					
PME*:					
Pulsipher	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: thin layer, slope, small stones.
Rock outcrop.					
PPE*:					
Pulsipher	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: thin layer, slope, small stones.
Pulsipher Variant	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: thin layer, slope, too clayey.
PRE*	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: thin layer, slope, too clayey.
Pulsipher Variant					
Re*.					
Riverwash					
RME*:					
Rock land.					
Moapa	Severe: depth to rock.	Severe: depth to rock, slope, seepage.	Severe: depth to rock, too sandy.	Moderate: slope.	Poor: too sandy, thin layer, area reclaim.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
RTF*: Rock land.					
St. Thomas	Severe: slope, depth to rock.	Severe: depth to rock, slope, small stones.	Severe: depth to rock, slope.	Severe: slope.	Poor: thin layer, small stones, slope.
SP*: Spring	Severe: percs slowly.	Severe: floods.	Moderate: floods, too clayey.	Moderate: floods.	Fair: too clayey.
Tb: Tobler	Severe: floods.	Severe: seepage, floods.	Severe: floods.	Severe: floods.	Good.
Tc: Tobler	Severe: floods, wetness.	Severe: seepage, floods, wetness.	Severe: wetness, floods, seepage.	Severe: floods, wetness, seepage.	Fair: wetness.
Td: Tobler	Severe: floods.	Severe: seepage, floods.	Severe: wetness, floods, seepage.	Severe: floods, seepage.	Good.
Te: Tobler	Severe: floods, wetness.	Severe: seepage, floods, wetness.	Severe: wetness, floods, seepage.	Severe: floods, wetness, seepage.	Fair: too clayey, wetness.
THB*: Tonopah	Moderate: floods.	Severe: seepage, small stones, floods.	Severe: too sandy.	Moderate: floods.	Poor: small stones, too sandy.
TMD*: Tonopah	Moderate: floods, slope.	Severe: slope, seepage, floods.	Severe: too sandy.	Moderate: floods, slope.	Poor: small stones, too sandy.
TnA, TnB: Toquop	Moderate: floods.	Severe: seepage, floods.	Severe: too sandy.	Slight	Poor: too sandy.
TsA: Toquop	Moderate: wetness, floods.	Severe: seepage, floods.	Severe: wetness, too sandy.	Moderate: wetness, floods.	Poor: too sandy.
TtA: Toquop	Moderate: floods.	Severe: seepage, floods.	Severe: too sandy.	Slight	Poor: too sandy.
TuA: Toquop	Moderate: wetness, floods.	Severe: seepage, floods.	Severe: wetness, too sandy.	Moderate: wetness, floods.	Poor: too sandy.
TvA: Toquop	Moderate: wetness, floods.	Severe: seepage, floods.	Severe: wetness, too sandy, seepage.	Moderate: wetness, floods, seepage.	Poor: too sandy.
Vd: Vinton	Moderate: floods.	Severe: seepage, floods.	Moderate: too sandy, floods.	Moderate: floods.	Fair: too sandy.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
VEF*: Virgin Peak	Severe: slope, depth to rock.	Severe: depth to rock, slope, seepage.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage.	Poor: thin layer, small stones, slope.
Rock land.					
Vg, Vn Virgin River	Severe: percs slowly, floods.	Severe: floods, seepage.	Severe: wetness, floods.	Severe: floods.	Fair: too clayey.
Vr Virgin River Variant	Severe: wetness, floods.	Severe: wetness, seepage, floods.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Poor: wetness.
WEE* Weiser	Severe: slope.	Severe: seepage, slope, small stones.	Moderate: slope.	Severe: slope.	Poor: slope, small stones.

* See map unit description for the composition and behavior of the map unit.

TABLE 9.--CONSTRUCTION MATERIALS

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," and "unsuited." Absence of an entry means soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ad*. Alluvial land				
Ae Anthony	Fair: low strength.	Poor: excess fines.	Unsuited	Good.
Af Anthony	Good	Poor: excess fines.	Poor: excess fines.	Good.
Ah Anthony	Fair: low strength, wetness.	Poor: excess fines.	Unsuited	Good.
AMC*, AOB* Arada	Good	Poor: excess fines.	Fair: excess fines.	Poor: too sandy.
ASC* Arada Variant	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited	Poor: too sandy.
ATA* Arizo	Good	Unsuited	Good	Poor: too sandy.
AVB*, AXC* Arizo	Good	Unsuited	Good	Poor: small stones, too sandy.
AYD* Arrolime	Fair: low strength.	Unsuited	Poor: excess fines.	Poor: small stones, excess salt.
BD*. Badland				
BFD*, BHC*, BMD* Bard	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited	Poor: small stones, area reclaim.
BNB* Bard	Poor: large stones, thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: small stones, large stones, area reclaim.
BOB*: Bard	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited	Poor: small stones, area reclaim.
Rough broken land.				
BRB*: Bard	Poor: large stones, thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: small stones, large stones, area reclaim.
Tonopah	Good	Unsuited	Good	Poor: too sandy, small stones.
BTC*: Bitter Spring	Good	Unsuited	Fair: excess fines.	Poor: small stones.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
BTC*: Arizo	Good	Unsuited	Good	Poor: small stones, too sandy.
Bu Black Butte	Good	Poor: excess fines.	Unsuited	Fair: too clayey, excess salt.
Bv Black Butte	Fair: wetness.	Poor: excess fines.	Unsuited	Fair: too clayey, excess salt.
Bw Bluepoint	Good	Poor: excess fines.	Unsuited	Poor: too sandy.
By Bluepoint	Good	Poor: excess fines.	Unsuited	Poor: excess salt.
Ca Calico	Fair: low strength, shrink-swell.	Unsuited	Unsuited	Fair: excess salt.
Cc Calico	Fair: low strength, shrink-swell.	Poor: excess fines.	Unsuited	Good.
Cd Calico	Fair: low strength, shrink-swell.	Unsuited	Unsuited	Poor: excess salt.
Cm Calico	Fair: low strength, shrink-swell.	Unsuited	Unsuited	Fair: excess salt.
Cn Calico Variant	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: too sandy.
Co Calico Variant	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: excess salt, too sandy.
CTC*: Colorock	Poor: area reclaim, thin layer.	Unsuited	Unsuited: thin layer.	Poor: area reclaim, small stones.
Tonopah	Good	Unsuited	Good	Poor: too sandy, small stones.
CYB* Crystal Springs	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: area reclaim, small stones.
Ea Eastland	Good	Poor: excess fines.	Poor: excess fines.	Poor: small stones.
FLC* Flattop	Poor: thin layer, area reclaim.	Unsuited	Unsuited: thin layer.	Poor: small stones, excess salt.
GAE*: Garr	Poor: slope, thin layer, area reclaim.	Unsuited	Unsuited: thin layer.	Poor: slope, small stones, area reclaim.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
GAE*: Rock outcrop.				
Gd---- Gila	Fair: low strength.	Unsuited----	Unsuited----	Poor: too sandy.
Ge---- Gila	Fair: low strength.	Unsuited----	Unsuited----	Good.
Gf---- Gila	Fair: low strength.	Unsuited----	Unsuited----	Poor: excess salt.
Gm---- Gila	Fair: low strength.	Unsuited----	Unsuited----	Good.
Gn---- Gila	Fair: low strength.	Unsuited----	Unsuited----	Poor: excess salt.
Go---- Glendale	Fair: low strength, shrink-swell.	Unsuited----	Unsuited----	Poor: too sandy.
Gr---- Glendale	Fair: low strength, shrink-swell.	Unsuited----	Unsuited----	Good.
Gs---- Glendale	Fair: low strength, shrink-swell.	Unsuited----	Unsuited----	Poor: excess salt.
Gv---- Grapevine	Fair: low strength.	Unsuited----	Unsuited----	Good.
Ir, It---- Ireteba	Fair: low strength.	Unsuited----	Unsuited----	Fair: excess salt.
La, Lc---- Land	Poor: low strength.	Unsuited----	Unsuited----	Poor: excess salt.
Ld---- Land	Poor: low strength.	Unsuited----	Unsuited----	Poor: excess salt.
MMB*, MOB*---- Mormon Mesa	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited----	Poor: area reclaim.
NAC*: Nickel----	Fair: slope.	Unsuited----	Fair: excess fines.	Poor: slope, small stones.
Arizo----	Good----	Unsuited----	Good----	Poor: small stones, too sandy.
Cave----	Poor: thin layer, area reclaim.	Poor: excess fines, thin layer.	Poor: excess fines, thin layer.	Poor: small stones, excess lime, area reclaim.
Oc, Oe---- Overton	Poor: low strength, shrink-swell.	Unsuited----	Unsuited----	Poor: too clayey.
On---- Overton	Poor: low strength, shrink-swell.	Unsuited----	Unsuited----	Poor: too clayey, excess salt.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Or Overton	Poor: low strength, shrink-swell, wetness.	Unsuited	Unsuited	Poor: wetness, too clayey, excess salt.
Os Overton Variant	Fair: wetness, low strength.	Unsuited	Unsuited	Poor: excess salt.
Ot Overton Variant	Fair: wetness, low strength.	Unsuited	Unsuited	Poor: excess salt.
PL*. Playas				
PME*: Pulsipher	Poor: thin layer, area reclaim.	Unsuited	Unsuited: thin layer.	Poor: small stones, slope, area reclaim.
Rock outcrop.				
PPE*: Pulsipher	Poor: thin layer, area reclaim.	Unsuited	Unsuited: thin layer.	Poor: small stones, slope, area reclaim.
Pulsipher Variant	Poor: shrink-swell, thin layer, low strength.	Unsuited	Unsuited	Poor: slope, small stones, too clayey.
PRE* Pulsipher Variant	Poor: shrink-swell, thin layer, low strength.	Unsuited	Unsuited	Poor: slope, small stones, too clayey.
Re*. Riverwash				
RME*: Rock land.				
Moapa	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited	Poor: too sandy.
RTF*: Rock land.				
St. Thomas	Poor: thin layer, slope, area reclaim.	Unsuited	Unsuited	Poor: small stones, large stones, slope.
SP* Spring	Poor: low strength.	Unsuited	Unsuited	Poor: excess salt.
Tb Tobler	Fair: low strength.	Unsuited	Unsuited	Good.
Tc Tobler	Fair: low strength, wetness.	Poor: excess fines.	Unsuited	Poor: excess salt.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Td---------- Tobler	Fair: low strength, wetness.	Poor: excess fines.	Unsuited----------	Good.
Te---------- Tobler	Fair: low strength, wetness.	Poor: excess fines.	Unsuited----------	Poor: too clayey, excess salt.
THB*, TMD*---------- Tonopah	Good----------	Unsuited----------	Good----------	Poor: too sandy, small stones.
TnA, TnB---------- Toquop	Good----------	Poor: excess fines.	Unsuited----------	Poor: too sandy.
TsA---------- Toquop	Fair: wetness.	Poor: excess fines.	Unsuited----------	Poor: too sandy.
TtA---------- Toquop	Good----------	Poor: excess fines.	Unsuited----------	Poor: too sandy.
TuA---------- Toquop	Fair: wetness.	Poor: excess fines.	Unsuited----------	Poor: thin layer.
TvA---------- Toquop	Fair: wetness.	Poor: excess fines.	Unsuited----------	Poor: excess salt.
Vd---------- Vinton	Good----------	Poor: excess fines.	Unsuited----------	Fair: thin layer.
VEF*: Virgin Peak----------	Poor: slope, thin layer, area reclaim.	Unsuited----------	Unsuited: thin layer.	Poor: slope, small stones, area reclaim.
Rock land.				
Vg---------- Virgin River	Poor: low strength, shrink-swell.	Poor: excess fines.	Unsuited----------	Poor: too clayey.
Vn---------- Virgin River	Poor: low strength, shrink-swell.	Poor: excess fines.	Unsuited----------	Poor: excess salt, too clayey.
Vr---------- Virgin River Variant	Poor: wetness..	Poor: excess fines.	Unsuited----------	Poor: excess salt, wetness.
WEE*---------- Weiser	Fair: slope.	Unsuited----------	Poor: excess fines.	Poor: small stones, slope.

* See map unit description for the composition and behavior of the map unit.

TABLE 10.--WATER MANAGEMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. Absence of an entry means soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
Ad*. Alluvial land						
Ae---------- Anthony	Seepage--------	Piping---------	No water-------	Favorable------	Favorable------	Soil blowing.
Af---------- Anthony	Seepage--------	Piping, seepage.	No water-------	Floods, poor outlets.	Droughty, floods, soil blowing.	Soil blowing.
Ah---------- Anthony	Seepage--------	Piping, low strength.	Deep to water--	Wetness--------	Soil blowing---	Soil blowing.
AMC*, AOB*-------- Arada	Seepage, slope.	Low strength, piping, seepage.	No water-------	Slope----------	Droughty, fast intake, soil blowing.	Soil blowing, too sandy, slope.
ASC*---------- Arada Variant	Slope, seepage, cemented pan.	Piping, thin layer, seepage.	No water-------	Slope, cemented pan.	Slope, droughty, soil blowing.	Cemented pan, slope.
ATA*---------- Arizo	Seepage--------	Seepage--------	No water-------	----------	----------	Too sandy, soil blowing.
AVB*, AXC*-------- Arizo	Slope, seepage.	Seepage--------	No water-------	----------	----------	Slope, too sandy.
AYD*---------- Arrolime	Seepage, slope.	Piping, low strength.	No water-------	----------	----------	Erodes easily, slope.
BD*. Badland						
BFD*, BHC*, BMD*-- Bard	Cemented pan, slope, seepage.	Piping, thin layer.	No water-------	----------	----------	Cemented pan, slope.
BNB*---------- Bard	Cemented pan, slope, seepage.	Piping, thin layer.	No water-------	----------	----------	Cemented pan, large stones.
BOB*: Bard----------	Cemented pan, slope, seepage.	Piping, thin layer.	No water-------	----------	----------	Cemented pan, slope.
Rough broken land.						
BRB*: Bard----------	Cemented pan, slope, seepage.	Piping, thin layer.	No water-------	----------	----------	Cemented pan.
Tonopah----------	Seepage, slope.	Seepage--------	No water-------	----------	----------	Too sandy, slope.
BTC*: Bitter Spring----	Seepage, slope.	Seepage--------	No water-------	----------	----------	Slope.
Arizo----------	Slope, seepage.	Seepage--------	No water-------	----------	----------	Slope, too sandy.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
Bu---------- Black Butte	Seepage--------	Low strength, piping, seepage.	No water-------	Cutbanks cave	Droughty-------	Erodes easily.
Bv---------- Black Butte	Seepage--------	Low strength, piping, seepage.	Deep to water	Wetness, cutbanks cave.	Droughty, wetness.	Erodes easily, wetness.
Bw---------- Bluepoint	Seepage--------	Piping, seepage.	No water-------	Cutbanks cave	Fast intake, droughty, seepage.	Too sandy, soil blowing.
By---------- Bluepoint	Seepage--------	Piping---------	Salty water.	Cutbanks cave, excess salt.	Excess salt, soil blowing.	Too sandy, soil blowing.
Ca---------- Calico	Seepage--------	Low strength, piping.	Deep to water	Floods, percs slowly, wetness.	Excess salt, floods, wetness.	Soil blowing, wetness.
Cc---------- Calico	Seepage--------	Low strength, piping.	No water-------	Floods, percs slowly.	Percs slowly, floods.	Soil blowing.
Cd, Cm---------- Calico	Seepage--------	Low strength, piping.	Deep to water	Floods, percs slowly, wetness.	Excess salt, floods, wetness.	Soil blowing, wetness.
Cn---------- Calico Variant	Favorable------	Piping, low strength.	No water-------	Percs slowly, floods.	Floods, fast intake, percs slowly.	Soil blowing, too sandy.
Co---------- Calico Variant	Favorable------	Piping, low strength.	Slow refill, salty water.	Wetness, percs slowly, excess salt.	Wetness, excess salt, percs slowly.	Soil blowing, too sandy, wetness.
CTC*: Colorock---------	Cemented pan, slope.	Thin layer, piping, seepage.	No water-------	----------	----------	Cemented pan, slope.
Tonopah----------	Seepage, slope.	Seepage--------	No water-------	----------	----------	Too sandy, slope.
CYB*---------- Crystal Springs	Cemented pan, slope.	Piping, thin layer.	No water-------	----------	----------	Cemented pan, slope.
Ea---------- Eastland	Seepage--------	Piping, seepage.	No water-------	Favorable------	Droughty, seepage.	Too sandy.
FLC*---------- Flattop	Slope, seepage, cemented pan.	Seepage, thin layer, piping.	No water-------	----------	----------	Slope, cemented pan.
GAE*: Garr----------	Depth to rock, slope.	Thin layer, piping.	No water-------	----------	----------	Depth to rock, slope.
Rock outcrop.						
Gd---------- Gila	Seepage--------	Low strength, hard to pack.	No water-------	Floods---------	Floods, fast intake, soil blowing.	Soil blowing.
Ge---------- Gila	Seepage--------	Low strength, hard to pack.	No water-------	Floods---------	Floods---------	Erodes easily.
Gf---------- Gila	Seepage--------	Low strength, hard to pack.	No water-------	Floods---------	Piping---------	Erodes easily.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
Gm, Gn---------- Gila	Seepage--------	Low strength, hard to pack.	Deep to water	Floods, wetness.	Erodes easily, floods.	Erodes easily.
Go---------- Glendale	Favorable------	Low strength, piping.	No water-------	Floods, poor outlets.	Floods, soil blowing.	Soil blowing.
Gr---------- Glendale	Favorable------	Low strength, piping.	No water-------	Floods, poor outlets.	Floods---------	Favorable.
Gs---------- Glendale	Favorable------	Low strength, excess salt, piping.	No water-------	Floods, excess salt.	Excess salt, floods.	Favorable.
Gv---------- Grapevine	Seepage--------	Low strength, piping.	No water-------	Favorable------	Erodes easily	Erodes easily.
Ir, It---------- Ireteba	Favorable------	Excess salt, low strength, piping.	No water-------	Poor outlets, excess salt, floods.	Excess salt, floods.	Favorable.
La---------- Land	Favorable------	Excess salt, low strength.	Deep to water, salty water.	Excess salt, percs slowly.	Excess salt, soil blowing.	Soil blowing.
Lc---------- Land	Favorable------	Excess salt, low strength.	Deep to water, salty water.	Excess salt, percs slowly, floods.	Excess salt.	Favorable.
Ld---------- Land	Favorable------	Excess salt, low strength.	Slow refill, salty water.	Wetness, floods, excess salt.	Excess salt, floods, wetness.	Wetness.
MMB*, MOB*-------- Mormon Mesa	Cemented pan, slope.	Piping, thin layer.	No water-------	----------	----------	Cemented pan, soil blowing.
NAC*:						
Nickel----------	Seepage, slope.	Seepage--------	No water-------	----------	----------	Slope.
Arizo----------	Slope, seepage.	Seepage--------	No water-------	----------	----------	Slope, too sandy.
Cave----------	Cemented pan, slope.	Thin layer-----	No water-------	----------	----------	Cemented pan, slope.
Oc---------- Overton	Favorable------	Hard to pack, low strength.	Slow refill----	Percs slowly, wetness.	Percs slowly, wetness, slow intake.	Percs slowly, wetness.
Oe, On, Or-------- Overton	Favorable------	Hard to pack, low strength.	Slow refill----	Excess salt, percs slowly, wetness.	Excess salt, percs slowly, wetness.	Percs slowly, wetness.
Os---------- Overton Variant	Favorable------	Low strength, piping.	Deep to water	Excess salt, wetness.	Excess salt, wetness, erodes easily.	Erodes easily, wetness.
Ot---------- Overton Variant	Favorable------	Low strength, piping.	Deep to water	Excess salt, floods, wetness.	Floods, excess salt, wetness.	Erodes easily, wetness.
PL*. Playas						
PME*:						
Pulsipher--------	Depth to rock, slope.	Thin layer-----	No water-------	----------	----------	Depth to rock, slope.
Rock outcrop.						

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
PPE*: Pulsipher	Depth to rock, slope.	Thin layer	No water			Depth to rock, slope.
Pulsipher Variant	Depth to rock, slope.	Thin layer, low strength.	No water			Depth to rock, slope.
PRE* Pulsipher Variant	Depth to rock, slope.	Thin layer, low strength.	No water			Depth to rock, slope.
Re*. Riverwash						
RME*: Rock land.						
Moapa	Depth to rock, slope.	Piping, thin layer, seepage.	No water			Depth to rock, slope, too sandy.
RTF*: Rock land.						
St. Thomas	Depth to rock, slope.	Thin layer, piping.	No water			Depth to rock, slope.
SP* Spring	Favorable	Excess salt, low strength.	Deep to water	Excess salt, percs slowly.	Excess salt, percs slowly.	Percs slowly.
Tb Tobler	Seepage	Low strength, seepage, piping.	No water	Favorable	Favorable	Soil blowing.
Tc Tobler	Seepage	Excess salt, low strength, piping.	Deep to water	Excess salt, floods, wetness.	Excess salt, floods, wetness.	Soil blowing, wetness.
Td Tobler	Seepage	Low strength, piping.	Deep to water	Floods, wetness.	Floods, erodes easily.	Erodes easily.
Te Tobler	Seepage	Excess salt, low strength, piping.	Deep to water	Excess salt, floods, wetness.	Excess salt, floods, wetness.	Wetness.
THB*, TMD* Tonopah	Seepage, slope.	Seepage	No water			Too sandy, slope.
TnA Toquop	Seepage	Piping, seepage.	No water	Cutbanks cave	Droughty, fast intake, seepage.	Too sandy, soil blowing.
TnB Toquop	Seepage, slope.	Piping, seepage.	No water	Cutbanks cave	Droughty, fast intake, slope.	Too sandy, slope.
TsA Toquop	Seepage	Piping, seepage.	Deep to water, cutbanks cave.	Cutbanks cave, wetness.	Fast intake, wetness, seepage.	Too sandy, soil blowing.
TtA Toquop	Seepage	Piping, seepage.	No water	Cutbanks cave	Droughty, seepage.	Too sandy, soil blowing.
TuA Toquop	Seepage	Piping, seepage.	Deep to water, cutbanks cave.	Cutbanks cave, wetness.	Wetness, seepage, droughty.	Too sandy, soil blowing.
TvA Toquop	Seepage	Excess salt, piping, seepage.	Deep to water, cutbanks cave, salty water.	Cutbanks cave, excess salt, wetness.	Droughty, excess salt, wetness.	Erodes easily.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
Vd---------- Vinton	Seepage--------	Piping, seepage.	No water-------	Cutbanks cave	Droughty, fast intake, seepage.	Too sandy.
VEF*: Virgin Peak------	Depth to rock, slope.	Piping, thin layer.	No water-------	----------	----------	Depth to rock, slope.
Rock land.						
Vg---------- Virgin River	Favorable------	Hard to pack, shrink-swell.	Deep to water	Floods, wetness.	Floods, percs slowly, wetness.	Percs slowly.
Vn---------- Virgin River	Favorable------	Hard to pack, shrink-swell.	Deep to water	Floods, wetness, excess salt.	Floods, excess salt, percs slowly.	Percs slowly.
Vr---------- Virgin River Variant	Favorable------	Excess salt, low strength.	Salty water----	Wetness, floods, cutbanks cave.	Excess salt, floods, wetness.	Percs slowly, wetness.
WEE*---------- Weiser	Slope, seepage.	Seepage--------	No water-------	----------	----------	Slope.

* See map unit description for the composition and behavior of the map unit.

TABLE 11.--RECREATIONAL DEVELOPMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Ad*. Alluvial land				
Ae---------- Anthony	Severe: floods.	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: soil blowing.
Af---------- Anthony	Severe: floods.	Moderate: floods, soil blowing.	Moderate: floods, soil blowing.	Moderate: soil blowing.
Ah---------- Anthony	Severe: floods.	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: soil blowing.
AMC*, AOB*---------- Arada	Severe: soil blowing, too sandy.	Severe: soil blowing, too sandy.	Severe: soil blowing, too sandy.	Severe: soil blowing, too sandy.
ASC*---------- Arada Variant	Severe: soil blowing, too sandy.	Severe: soil blowing, too sandy.	Severe: soil blowing, too sandy.	Severe: soil blowing, too sandy.
ATA*---------- Arizo	Severe: floods.	Severe: too sandy, soil blowing.	Severe: floods, too sandy, soil blowing.	Severe: too sandy, soil blowing.
AVB*---------- Arizo	Severe: floods, small stones.	Severe: too sandy, small stones.	Severe: floods, too sandy, small stones.	Severe: too sandy, small stones.
AXC*---------- Arizo	Severe: floods, small stones.	Severe: small stones.	Severe: floods, small stones.	Severe: small stones.
AYD*---------- Arrolime	Severe: floods.	Moderate: small stones, slope, dusty.	Severe: small stones, slope.	Moderate: small stones, dusty.
BD*. Badland				
BFD*---------- Bard	Severe: soil blowing, too sandy.	Severe: soil blowing, too sandy.	Severe: cemented pan, small stones, slope.	Severe: soil blowing, too sandy.
BHC*---------- Bard	Moderate: small stones.	Moderate: small stones.	Severe: small stones, cemented pan.	Moderate: small stones.
BMD*---------- Bard	Moderate: slope, small stones.	Moderate: small stones, slope.	Severe: cemented pan, small stones, slope.	Moderate: small stones.
BNB*---------- Bard	Severe: large stones, small stones.	Severe: large stones, small stones.	Severe: large stones, small stones, cemented pan.	Severe: large stones, small stones.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
BOB*:				
Bard	Moderate: small stones.	Moderate: small stones.	Severe: small stones, cemented pan.	Moderate: small stones.
Rough broken land.				
BRB*:				
Bard	Severe: large stones, small stones.	Severe: large stones, small stones.	Severe: large stones, small stones, cemented pan.	Severe: large stones, small stones.
Tonopah	Severe: floods.	Moderate: small stones.	Moderate: floods, small stones.	Moderate: small stones.
BTC*:				
Bitter Spring	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Moderate: small stones.
Arizo	Severe: floods, small stones.	Severe: small stones.	Severe: slope, floods, small stones.	Severe: small stones.
Bu, Bv Black Butte	Severe: floods.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
Bw Bluepoint	Severe: floods.	Moderate: soil blowing, too sandy.	Moderate: soil blowing, too sandy.	Moderate: soil blowing, too sandy.
By Bluepoint	Severe: floods.	Moderate: soil blowing.	Moderate: soil blowing.	Moderate: soil blowing.
Ca, Cc, Cd, Cm Calico	Severe: floods.	Moderate: floods, soil blowing.	Moderate: floods, soil blowing.	Moderate: floods, soil blowing.
Cn, Co Calico Variant	Severe: floods, soil blowing.	Severe: soil blowing.	Severe: soil blowing.	Severe: soil blowing.
CTC*:				
Colorock	Severe: floods, small stones.	Severe: small stones.	Severe: cemented pan, small stones.	Severe: small stones.
Tonopah	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
CYB* Crystal Springs	Severe: floods.	Moderate: small stones.	Severe: cemented pan.	Moderate: small stones.
Ea Eastland	Severe: floods.	Moderate: small stones, dusty.	Severe: small stones.	Moderate: small stones, dusty.
FLC* Flattop	Severe: floods.	Moderate: too clayey, small stones.	Moderate: small stones, too clayey.	Moderate: small stones, too clayey.
GAE*:				
Garr	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones, depth to rock.	Severe: small stones, slope.
Rock outcrop.				

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Gd Gila	Severe: floods, too sandy, soil blowing.	Severe: too sandy, soil blowing.	Severe: too sandy, soil blowing.	Severe: soil blowing, too sandy.
Ge, Gf Gila	Severe: floods.	Moderate: floods, dusty.	Moderate: floods, dusty.	Moderate: dusty.
Gm, Gn Gila	Severe: floods.	Moderate: dusty, floods.	Moderate: floods, dusty.	Moderate: dusty.
Go Glendale	Severe: floods, too sandy, soil blowing.	Severe: too sandy, soil blowing.	Severe: too sandy, soil blowing.	Severe: too sandy, soil blowing.
Gr, Gs Glendale	Severe: floods.	Moderate: dusty,. floods.	Moderate: floods, dusty.	Moderate: dusty.
Gv Grapevine	Severe: floods.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
Ir Ireteba	Severe: floods.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
It Ireteba	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
La Land	Severe: soil blowing.	Severe: soil blowing.	Severe: soil blowing.	Severe: soil blowing.
Lc Land	Severe: dusty, floods.	Severe: dusty.	Severe: dusty, floods.	Severe: dusty.
Ld Land	Severe: floods, dusty.	Severe: dusty.	Severe: dusty.	Severe: dusty.
MMB*, MOB* Mormon Mesa	Severe: soil blowing.	Severe: soil blowing.	Severe: soil blowing, cemented pan.	Severe: soil blowing.
NAC*: Nickel	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.
Arizo	Severe: floods, small stones.	Severe: small stones.	Severe: floods, small stones.	Severe: small stones.
Cave	Moderate: slope, dusty, small stones.	Moderate: slope, dusty, small stones.	Severe: slope, cemented pan.	Moderate: dusty, small stones.
Oc, Oe, On Overton	Severe: too clayey, floods.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Or Overton	Severe: wetness, too clayey, floods.	Severe: wetness, too clayey.	Severe: too clayey, wetness.	Severe: wetness, too clayey.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Os, Ot Overton Variant	Severe: floods.	Moderate: floods, wetness, dusty.	Moderate: floods, wetness, dusty.	Moderate: floods, wetness, dusty.
PL*. Playas				
PME*: Pulsipher	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Moderate: small stones, slope.
Rock outcrop.				
PPE*: Pulsipher	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Moderate: small stones, slope.
Pulsipher Variant	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Moderate: slope, too clayey.
PRE* Pulsipher Variant	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Moderate: slope, too clayey.
Re*. Riverwash				
RME*: Rock land.				
Moapa	Severe: soil blowing, too sandy.	Severe: soil blowing, too sandy.	Severe: soil blowing, slope, too sandy.	Severe: soil blowing, too sandy.
RTF*: Rock land.				
St. Thomas	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, large stones.	Severe: slope, depth to rock, small stones.	Severe: small stones, large stones, slope.
SP* Spring	Severe: floods.	Moderate: too clayey, dusty.	Moderate: too clayey, dusty.	Moderate: too clayey, dusty.
Tb Tobler	Severe: floods.	Moderate: floods.	Moderate: floods.	Moderate: floods.
Tc, Td Tobler	Severe: floods.	Moderate: floods.	Moderate: floods.	Moderate: floods.
Te Tobler	Severe: floods, too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
THB*---------- Tonopah	Severe: floods.	Moderate: small stones.	Moderate: small stones, slope.	Moderate: small stones.
TMD*---------- Tonopah	Severe: small stones.	Severe: small stones.	Severe: small stones, slope.	Severe: small stones.
TnA, TnB---------- Toquop	Severe: soil blowing, too sandy, floods.	Severe: soil blowing, too sandy.	Severe: too sandy, soil blowing.	Severe: soil blowing, too sandy.
TsA---------- Toquop	Severe: soil blowing, too sandy, floods.	Severe: soil blowing, too sandy.	Severe: soil blowing, too sandy.	Severe: soil blowing, too sandy.
TtA, TuA---------- Toquop	Severe: floods.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
TvA---------- Toquop	Severe: floods.	Moderate: dusty, too clayey.	Moderate: dusty, too clayey.	Moderate: dusty, too clayey.
Vd---------- Vinton	Severe: floods.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
VEF*: Virgin Peak----------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.
Rock land.				
Vg, Vn---------- Virgin River	Severe: floods, too clayey.	Severe: floods, too clayey.	Severe: too clayey.	Severe: too clayey.
Vr---------- Virgin River Variant	Severe: floods.	Severe: floods.	Moderate: floods, too clayey.	Moderate: floods, too clayey.
WEE*---------- Weiser	Severe: slope, small stones, large stones.	Severe: slope, small stones, large stones.	Severe: slope, small stones, large stones.	Severe: small stones, large stones.

* See map unit description for the composition and behavior of the map unit.

TABLE 12.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means greater than. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ad*. Alluvial land											
Ae	0-8	Fine sandy loam	SM	A-4	0	100	100	80-90	40-50	---	NP
Anthony	8-60	Fine sandy loam, sandy loam.	SM	A-4	0	100	95-100	65-75	35-45	15-25	NP-5
Af	0-8	Fine sandy loam	SM	A-4	0	100	100	70-80	40-50	---	NP
Anthony	8-30	Fine sandy loam, sandy loam.	SM	A-4	0	100	95-100	65-75	35-45	15-25	NP-5
	30-60	Very gravelly sandy loam.	GM	A-1	15-25	40-50	30-40	20-30	10-15	---	NP
Ah	0-8	Fine sandy loam	SM	A-4	0	100	100	70-80	40-50	---	NP
Anthony	8-60	Fine sandy loam, sandy loam.	SM	A-4	0	100	95-100	65-75	35-45	15-25	NP-5
AMC*	0-6	Fine sand	SP-SM	A-3	0	100	100	75-85	5-10	---	NP
Arada	6-27	Fine sand	SM	A-2	0	100	100	80-90	10-20	---	NP
	27-37	Gravelly loamy fine sand.	SM	A-1	0	85-95	70-75	40-50	10-20	---	NP
	37-60	Stratified very gravelly fine sandy loam to very gravelly loamy coarse sand.	GP-GM	A-1	0-5	35-45	10-25	5-15	5-10	---	NP
AOB*	0-6	Fine sand	SP-SM	A-3	0	100	100	75-85	5-10	---	NP
Arada	6-24	Fine sand	SM	A-2	0	100	100	80-90	10-20	---	NP
	24-60	Stratified very gravelly fine sandy loam to very gravelly loamy coarse sand.	GP-GM	A-1	0-5	35-45	10-25	5-15	5-10	---	NP
ASC*	0-6	Fine sand	SP-SM	A-3	0	100	100	75-85	5-10	---	NP
Arada Variant	6-30	Fine sand	SM	A-2	0	100	100	80-90	10-20	---	NP
	30	Indurated	---	---	---	---	---	---	---	---	---
ATA*	0-8	Fine sand	SM	A-2	0	100	95-100	65-75	20-30	---	NP
Arizo	8-60	Stratified cobbly coarse sand to very gravelly loamy sand.	GP-GM, GP	A-1	0-35	35-55	20-50	10-30	0-10	---	NP
AVB*	0-8	Gravelly fine sand.	SP-SM, SM	A-1	0-15	60-70	50-65	40-50	5-15	---	NP
Arizo	8-60	Stratified cobbly coarse sand to very gravelly loamy sand.	GP-GM, GP	A-1	0-35	35-55	20-50	10-30	0-10	---	NP
AXC*	0-8	Very gravelly loamy sand.	SP-SM, SM	A-1	0-15	60-70	25-55	15-25	5-15	---	NP
Arizo	8-60	Stratified cobbly coarse sand to very gravelly loamy sand.	GP-GM, GP	A-1	0-35	35-55	20-50	10-30	0-10	---	NP

See footnote at end of table.

TABLE 12.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AYD*---------- Arrolime	0-5	Gravelly silt loam.	ML	A-4	0	70-80	60-70	55-65	50-60	30-40	5-10
	5-49	Very gravelly silt loam.	GM	A-2	0	25-35	15-30	15-25	10-20	30-40	5-10
	49-60	Silty clay loam	CL	A-7	0	95-100	95-100	90-95	80-90	40-50	15-25
BD*. Badland											
BFD*---------- Bard	0-5	Gravelly fine sand.	SM	A-1	0	70-80	55-65	35-45	10-20	---	NP
	5-19	Fine sandy loam, sandy loam, loam.	SM	A-4	0	90-95	80-90	55-65	35-50	---	NP
	19	Indurated-------	---	---	---	---	---	---	---	---	---
BHC*---------- Bard	0-5	Gravelly fine sandy loam.	SM	A-2, A-1	0	70-80	55-65	40-50	20-30	20-30	NP-5
	5-19	Fine sandy loam, sandy loam, loam.	SM	A-4	0	90-95	80-90	55-65	35-50	---	NP
	19	Indurated-------	---	---	---	---	---	---	---	---	---
BMD*---------- Bard	0-5	Very gravelly fine sandy loam.	GM	A-1	0-5	45-60	35-45	25-35	10-20	20-30	NP-5
	5-19	Fine sandy loam, sandy loam, loam.	SM	A-4	0	90-95	80-90	55-65	35-50	---	NP
	19	Indurated-------	---	---	---	---	---	---	---	---	---
BNB*---------- Bard	0-4	Very stony loam	SM	A-2	15-25	70-80	55-65	40-55	25-35	20-30	NP-5
	4-15	Fine sandy loam	SM	A-2, A-4	0-5	90-95	80-90	55-65	30-40	---	NP
	15	Indurated-------	---	---	---	---	---	---	---	---	---
BOB*: Bard----------	0-5	Very gravelly fine sandy loam.	GM	A-1	0-5	45-60	35-45	25-35	10-20	20-30	NP-5
	5-19	Fine sandy loam, sandy loam, loam.	SM	A-4	0	90-95	80-90	55-65	35-50	---	NP
	19	Indurated-------	---	---	---	---	---	---	---	---	---
Rough broken land.											
BRB*: Bard----------	0-4	Very stony loam	SM	A-2	15-25	70-80	55-65	40-55	25-35	20-30	NP-5
	4-15	Fine sandy loam	SM	A-2, A-4	0-5	90-95	80-90	55-65	30-40	---	NP
	15	Indurated-------	---	---	---	---	---	---	---	---	---
Tonopah----------	0-6	Gravelly fine sandy loam.	SM	A-2, A-1	0-5	65-75	60-70	35-55	20-30	---	NP
	6-60	Very gravelly sand.	GP	A-1	0-5	20-30	15-25	5-15	0-5	---	NP
BTC*: Bitter Spring-----	0-2	Very gravelly loam.	GM-GC	A-2	0-5	45-55	40-50	35-45	25-35	20-30	5-10
	2-7	Sandy loam, gravelly sandy loam.	SM-SC	A-2	0	75-85	60-80	40-50	20-30	20-30	5-10
	7-50	Very gravelly sandy loam.	GP-GM	A-1	0-5	25-35	20-30	10-20	5-10	15-25	NP-5

See footnote at end of table.

TABLE 12.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BTC*:											
Arizo	0-8	Very gravelly loamy sand.	SP-SM, SM	A-1	0-15	60-70	25-55	15-25	5-15	---	NP
	8-60	Stratified cobbly coarse sand to very gravelly loamy sand.	GP-GM, GP	A-1	0-35	35-55	20-50	10-30	0-10	---	NP
Bu	0-6	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-95	20-30	5-15
Black Butte	6-20	Stratified silty clay loam to fine sandy loam.	CL	A-6	0	100	100	95-100	65-75	25-35	10-15
	20-60	Fine sand	SM	A-2	0	100	100	80-90	10-20	---	NP
Bv	0-6	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-95	20-30	5-15
Black Butte	6-20	Stratified silty clay loam to fine sandy loam.	CL	A-6	0	100	100	95-100	65-75	25-35	10-15
	20-60	Fine sand	SM	A-2	0	100	100	80-90	10-20	---	NP
Bw	0-9	Loamy fine sand	SM	A-2	0	90-100	90-100	50-85	20-35	---	NP
Bluepoint	9-41	Loamy fine sand, fine sand, loamy sand.	SM	A-2	0	90-100	90-100	70-80	15-25	---	NP
	41-80	Stratified loamy fine sand to very fine sandy loam.	SM	A-2, A-4	0	90-100	90-100	75-85	30-45	---	NP
By	0-9	Fine sandy loam	SM	A-4	0	90-100	90-100	75-85	35-45	---	NP
Bluepoint	9-41	Loamy fine sand, fine sand, loamy sand.	SM	A-2	0	90-100	90-100	70-80	15-25	---	NP
	41-80	Stratified fine sand to very fine sandy loam.	SM	A-2, A-4	0	90-100	90-100	75-85	30-45	---	NP
Ca	0-6	Fine sandy loam	SM	A-4	0	100	100	70-80	40-50	---	NP
Calico	6-22	Stratified silt loam to sandy loam.	ML	A-4	0	100	100	80-95	55-75	---	NP
	22-43	Stratified clay to silt loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-55	20-35
	43-60	Fine sand	SM	A-2	0	100	100	65-75	20-30	---	NP
Cc	0-6	Fine sandy loam	SM	A-4	0	100	100	70-80	40-50	---	NP
Calico	6-22	Stratified silt loam to fine sandy loam.	ML	A-4	0	100	100	80-95	55-75	---	NP
	22-43	Stratified silty clay to silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-55	20-30
	43-60	Fine sand	SM	A-2	0	100	100	65-75	20-30	---	NP
Cd	0-6	Fine sandy loam	SM	A-4	0	100	100	70-80	40-50	---	NP
Calico	6-22	Stratified silt loam to sandy loam.	ML	A-4	0	100	100	80-95	55-75	---	NP
	22-43	Stratified clay to silt loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-55	20-35
	43-60	Fine sand	SM	A-2	0	100	100	65-75	20-30	---	NP

See footnote at end of table.

TABLE 12.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Cm	0-6	Clay loam	CL	A-6	0	100	100	90-100	70-80	30-40	10-20
Calico	6-22	Stratified silt loam to sandy loam.	ML	A-4	0	100	100	80-95	55-75	---	NP
	22-43	Stratified clay to silt loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-55	20-35
	43-60	Fine sand	SM	A-2	0	100	100	65-75	20-30	---	NP
Cn	0-9	Loamy fine sand	SM	A-2, A-4	0	100	100	60-75	30-40	---	NP
Calico Variant	9-27	Stratified loamy fine sand to fine sandy loam.	SM	A-2, A-4	0	100	100	65-80	30-50	---	NP
	27-60	Stratified silty clay to silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-55	20-30
Co	0-9	Loamy fine sand	SM	A-2, A-4	0	100	100	60-75	30-40	---	NP
Calico Variant	9-27	Stratified loamy fine sand to fine sandy loam.	SM	A-2, A-4	0	100	100	65-80	30-50	---	NP
	27-60	Stratified silty clay to silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-55	20-35
CTC*:											
Colorock	0-3	Very gravelly loam.	GC	A-2, A-6	0-15	35-60	30-50	25-50	15-40	30-40	10-20
	3-15	Very gravelly sandy loam.	GP-GM	A-1	0-15	25-40	15-30	10-20	5-10	---	NP
	15-42	Indurated	---	---	---	---	---	---	---	---	---
	42-60	Very gravelly sandy loam.	GP-GM	A-1	15-30	20-35	10-20	5-15	5-10	---	NP
Tonopah	0-6	Very gravelly sandy loam.	GM	A-1	0-5	35-45	30-40	20-30	10-15	---	NP
	6-60	Very gravelly sand.	GP, GW	A-1	0-5	20-30	15-25	5-15	0-5	---	NP
CYB*	0-1	Gravelly sandy loam.	SM	A-2, A-1	0	75-85	65-75	40-50	20-30	---	NP
Crystal Springs	1-11	Gravelly fine sandy loam.	SM	A-2	0	70-80	60-70	45-55	25-35	---	NP
	11	Indurated	---	---	---	---	---	---	---	---	---
Ea	0-17	Gravelly sandy loam.	SM	A-1	0-5	60-70	50-60	30-40	15-25	---	NP
Eastland	17-38	Very gravelly sand.	GP	A-1	0-15	20-30	10-20	5-15	0-5	---	NP
	38-60	Stratified gravelly loamy sand to gravelly sandy loam.	SM	A-1	0-15	75-85	65-75	30-45	10-25	---	NP
FLC*	0-5	Gravelly clay loam.	GC, CL	A-6	0	60-75	60-70	55-65	40-55	30-40	10-20
Flattop	5-22	Very gravelly fine sandy loam.	GM	A-1	0-5	45-55	35-50	30-40	15-25	---	NP
	22-30	Very gravelly loamy fine sand, very gravelly fine sand.	GP-GM, GP	A-1	0-5	25-35	15-30	10-25	0-10	---	NP
	30-60	Cemented	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 12.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
GAE*:											
Garr	0-2	Very cobbly sandy loam.	GM	A-1	35-50	45-55	45-55	30-45	15-20	---	NP
	2-16	Very gravelly fine sandy loam, very gravelly sandy loam, very gravelly loam.	GM, GP-GM	A-1	5-10	30-40	20-30	15-25	5-20	---	NP
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
Gd	0-9	Fine sand	SM	A-2	0	95-100	95-100	85-90	15-25	---	NP
Gila	9-60	Stratified silt loam to fine sandy loam.	ML	A-4	0	95-100	95-100	80-95	60-75	15-25	NP-5
Ge	0-9	Loam	ML	A-4	0	95-100	95-100	80-90	60-70	---	NP
Gila	9-60	Stratified silt loam to fine sandy loam.	ML	A-4	0	95-100	95-100	80-95	60-75	15-25	NP-5
Gf	0-9	Loam	ML	A-4	0	95-100	95-100	80-90	60-70	15-25	NP
Gila	9-60	Stratified silt loam to fine sandy loam.	ML	A-4	0	95-100	95-100	80-95	60-75	15-25	NP-5
Gm, Gn	0-9	Loam	ML	A-4	0	95-100	95-100	85-95	60-70	---	NP
Gila	9-60	Stratified silt loam to fine sandy loam.	ML	A-4	0	95-100	95-100	80-95	60-75	15-25	NP-5
Go	0-8	Fine sand	SM	A-2	0	100	100	80-90	20-30	---	NP
Glendale	8-60	Stratified clay loam to very fine sandy loam.	CL, CL-ML	A-4, A-6	0	100	100	95-100	75-85	20-30	5-15
Gr	0-8	Loam	ML, CL-ML	A-4	0	100	100	85-100	55-65	15-25	NP-10
Glendale	8-60	Stratified clay loam to very fine sandy loam.	CL, CL-ML	A-4, A-6	0	100	100	95-100	75-85	20-30	5-15
Gs	0-9	Loam	ML, CL-ML	A-4	0	100	100	85-95	55-65	15-25	NP-10
Glendale	9-60	Stratified clay loam to very fine sandy loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	75-85	20-30	5-15
Gv	0-10	Loam	ML	A-4	0	100	100	85-95	60-70	25-35	NP-5
Grapevine	10-60	Stratified fine sandy loam to clay loam.	SM, SM-SC	A-4	0	100	100	70-80	35-50	15-25	NP-10
Ir, It	0-12	Loam	ML, CL-ML	A-4	0	100	100	85-95	60-70	20-30	NP-10
Ireteba	12-60	Stratified loam to loamy fine sand.	SM, ML	A-4	0	95-100	90-100	70-80	45-60	15-25	NP-5
La	0-4	Loamy fine sand	SM	A-2	0	100	100	70-85	20-35	---	NP
Land	4-60	Stratified silty clay to silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	25-45	10-25

See footnote at end of table.

TABLE 12.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Lc	0-4	Silty clay loam	ML	A-7	0	100	100	95-100	85-95	40-50	10-20
Land	4-60	Stratified silty clay to silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	25-45	10-25
Ld	0-4	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	30-40	10-20
Land	4-60	Stratified silty clay to silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	25-45	10-25
MMB*	0-2	Loamy fine sand	SM	A-2	0-5	90-100	80-90	50-60	20-30	---	NP
Mormon Mesa	2-16	Fine sandy loam	SM	A-4	0-5	95-100	85-100	65-75	40-50	---	NP
	16	Indurated	---	---	---	---	---	---	---	---	---
MOB*	0-2	Fine sandy loam	SM	A-4	0-5	90-100	80-90	60-70	35-45	---	NP
Mormon Mesa	2-16	Fine sandy loam	SM	A-4	0-5	95-100	85-100	65-75	40-50	---	NP
	16	Indurated	---	---	---	---	---	---	---	---	---
NAC*:											
Nickel	0-7	Gravelly sandy loam.	GM, SM	A-1	0-5	55-65	50-60	30-40	15-25	---	NP
	7-60	Very gravelly sandy loam, very gravelly coarse sandy loam.	GW-GM	A-1	0-5	20-40	10-35	5-20	5-10	---	NP
Arizo	0-8	Very gravelly loamy sand.	SP-SM, SM	A-1	0-15	60-70	25-55	15-25	5-15	---	NP
	8-60	Stratified cobbly coarse sand to very gravelly loamy sand.	GP-GM, GP	A-1	0-35	35-55	20-50	10-30	0-10	---	NP
Cave	0-4	Gravelly loam	SC, SM-SC	A-4,	0-5	70-90	60-75	50-65	35-50	25-30	5-15
	4-15	Gravelly sandy	SM	A-2, A-6	0-5	70-90	60-75	45-60	25-35	20-25	NP-5
	15	Indurated	---	---	---	---	---	---	---	---	---
Oc	0-7	Silty clay	CH	A-7	0	100	100	95-100	90-95	50-65	30-40
Overton	7-25	Silty clay	CH	A-7	0	100	100	95-100	90-95	50-65	30-40
	25-60	Stratified silty clay to fine sandy loam.	CL, CH	A-7	0	100	100	95-100	80-90	45-55	25-35
Oe, On	0-7	Silty clay	CH	A-7	0	100	100	95-100	90-95	50-65	30-40
Overton	7-25	Silty clay	CH, CL	A-7	0	100	100	95-100	90-95	40-60	20-40
	25-60	Stratified silty clay to fine sandy loam.	CH, CL	A-7	0	100	100	95-100	80-90	45-55	25-35
Or	0-7	Clay	CH	A-7	0	100	100	95-100	90-95	50-65	30-40
Overton	7-25	Silty clay	CH, CL	A-7	0	100	100	95-100	90-95	40-60	20-40
	25-60	Stratified silty clay to fine sandy loam.	CH, CL	A-7	0	100	100	95-100	80-90	45-55	25-35
Os, Ot	0-11	Silt loam	ML, CL-ML	A-4	0	100	100	90-100	75-85	15-25	NP-10
Overton Variant	11-31	Stratified loamy fine sand to silt loam.	ML	A-4	0	100	100	85-95	50-65	15-25	NP-5
	31-60	Stratified fine sandy loam to clay loam.	ML	A-4	0	100	100	80-95	50-75	15-25	NP-5
PL*.											
Playas											

See footnote at end of table.

TABLE 12.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
PME*:											
Pulsipher	0-2	Gravelly loam	SM	A-4	0-5	70-80	60-70	55-65	35-45	25-35	NP-5
	2-15	Very gravelly sandy loam, very gravelly loam, very gravelly coarse sandy loam.	GP-GM, GM	A-1	5-25	30-40	20-30	10-20	5-20	---	NP
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
PPE*:											
Pulsipher	0-2	Gravelly loam	SM	A-4	0-5	70-80	60-70	55-65	35-45	25-35	NP-5
	2-15	Very gravelly sandy loam, very gravelly loam, very gravelly coarse sandy loam.	GP-GM, GM	A-1	5-25	30-40	20-30	10-20	5-20	---	NP
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Pulsipher Variant-	0-6	Gravelly clay loam.	SC, CL	A-6, A-7	0-5	80-90	60-70	55-70	45-55	35-45	15-25
	6-14	Gravelly clay	GC, CH	A-7	0	60-75	50-70	50-65	40-60	50-60	35-45
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
PRE*	0-6	Gravelly clay loam.	SC, CL	A-6, A-7	0-5	80-90	60-70	55-70	45-55	35-45	15-25
Pulsipher Variant	6-14	Gravelly clay	GC, CH	A-7	0	60-75	50-70	50-65	40-60	50-60	35-45
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Re*.											
Riverwash											
RME*:											
Rock land.											
Moapa	0-4	Fine sand	SM	A-2	0	85-95	75-85	70-85	15-20	---	NP
	4-30	Fine sand, sand, gravelly fine sand.	SM, SP-SM	A-2, A-3, A-1	0	70-90	50-85	30-75	5-15	---	NP
	30-36	Weathered bedrock.	---	---	---	---	---	---	---	---	---
RTF*:											
Rock land.											
St. Thomas	0-2	Cobbly loam	GM	A-4	20-40	55-65	45-60	40-55	35-45	25-35	NP-5
	2-12	Very cobbly loam, very gravelly loam.	GM	A-1	15-50	35-45	25-40	20-35	15-25	25-35	NP-5
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SP*	0-5	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	15-25
Spring	5-43	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-90	35-45	15-25
	43-60	Silt loam	CL-ML	A-4	0	100	100	90-100	75-85	15-25	5-10

See footnote at end of table.

TABLE 12.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Tb, Tc	0-13	Fine sandy loam	SM	A-4	0	95-100	90-95	65-75	35-45	20-30	NP-5
Tobler	13-60	Stratified silt loam to loamy fine sand.	SM	A-4	0	95-100	90-95	65-75	35-45	15-25	NP-5
Td	0-13	Silt loam	ML, CL-ML	A-4	0	100	100	90-100	75-85	20-30	NP-10
Tobler	13-60	Stratified silt loam to loamy fine sand.	SM	A-4	0	95-100	95-100	85-95	35-45	15-25	NP-5
Te	0-13	Clay	CH	A-7	0	100	100	90-100	75-85	50-65	25-35
Tobler	13-60	Stratified silt loam to loamy fine sand.	SM	A-4	0	95-100	90-95	65-75	35-45	15-25	NP-5
THB*	0-6	Gravelly sandy loam.	SM	A-2, A-1	0-5	65-75	60-70	35-55	20-30	---	NP
Tonopah	6-60	Very gravelly sand, very gravelly loamy sand.	GP	A-1	0-5	20-30	15-25	5-15	0-5	---	NP
TMD*	0-6	Very gravelly sandy loam.	GM	A-1	0-5	35-45	30-40	20-30	10-15	---	NP
Tonopah	6-60	Very gravelly sand, very gravelly loamy sand.	GP	A-1	0-5	20-30	15-25	5-15	0-5	---	NP
TnA, TnB	0-9	Fine sand	SM	A-2	0	95-100	90-100	60-80	10-30	---	NP
Toquop	9-60	Fine sand, sand	SM	A-2	0	90-100	85-100	50-80	10-25	---	NP
TsA	0-9	Fine sand	SM	A-2	0	95-100	90-100	60-80	10-30	---	NP
Toquop	9-60	Fine sand, sand	SM	A-2	0	90-100	80-100	50-80	10-25	---	NP
TtA	0-9	Fine sandy loam	SM	A-4	0	95-100	90-100	70-80	40-50	---	NP
Toquop	9-60	Fine sand, sand	SM	A-2	0	90-100	85-100	50-80	10-25	---	NP
TuA	0-9	Fine sandy loam	SM	A-4	0	95-100	90-100	70-80	40-50	---	NP
Toquop	9-60	Fine sand, sand	SM	A-2	0	90-100	80-100	50-80	10-25	---	NP
TvA	0-9	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-45	10-20
Toquop	9-60	Fine sand, sand	SM	A-2	0	90-100	85-100	50-80	10-25	---	NP
Vd	0-12	Fine sandy loam	SM	A-4	0	95-100	95-100	70-80	40-50	---	NP
Vinton	12-60	Loamy sand, fine sand.	SM	A-2	0	95-100	95-100	70-90	15-25	---	NP
VEF*:											
Virgin Peak	0-6	Very gravelly loam.	GM, GM-GC	A-2	0-15	35-45	25-35	20-30	15-25	25-35	5-10
	6-14	Weathered bedrock.	---	---	---	---	---	---	---	---	---
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock land.											
Vg, Vn	0-6	Silty clay	CH	A-7	0	100	100	95-100	90-95	50-60	30-40
Virgin River	6-35	Stratified clay loam to clay.	CL, CH	A-7	0	100	100	90-100	75-85	40-55	20-35
	35-60	Stratified fine sand to silt loam.	SM	A-2, A-4	0	100	100	70-80	30-45	---	NP
Vr	0-6	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	40-50	15-25
Virgin River	6-28	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	40-50	15-25
Variant	28-60	Fine sand	SM	A-2	0	100	100	65-75	20-30	---	NP

See footnote at end of table.

TABLE 12.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
WEE*---------- Weiser	0-6	Cobbly sandy loam.	SM	A-1, A-2	25-40	70-80	60-70	35-45	20-30	---	NP
	6-60	Very gravelly fine sandy loam, very gravelly sandy loam.	GM	A-1	25-40	40-50	30-40	20-30	10-20	---	NP

* See map unit description for the composition and behavior of the map unit.

TABLE 13.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means greater than. The erosion tolerance factor (T) is for the entire profile. Absence of an entry means data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
							Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH	Mmhos/cm						
Ad*. Alluvial land											
Ae	0-8	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	High	Low	0.28	5	3
Anthony	8-60	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	High	Low	0.28		
Af	0-8	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	High	Low	0.28	5	3
Anthony	8-30	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	High	Low	0.28		
	30-60	6.0-20	0.04-0.06	7.9-8.4	<2	Low	High	Low	0.15		
Ah	0-8	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	High	Low	0.28	5	3
Anthony	8-60	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	High	Low	0.28		
AMC*	0-6	>20	0.05-0.07	7.9-8.4	<2	Low	Moderate	Low	0.15	5	1
Arada	6-27	>20	0.05-0.07	8.5-9.0	<2	Low	Moderate	Low	0.15		
	27-37	6.0-20	0.06-0.08	8.5-9.0	<2	Low	High	Low	0.10		
	37-60	2.0-6.0	0.04-0.07	8.5-9.0	<2	Low	High	Low	0.10		
AOB*	0-6	>20	0.05-0.07	7.9-8.4	<2	Low	Moderate	Low	0.15	5	1
Arada	6-24	>20	0.05-0.07	8.5-9.0	<2	Low	Moderate	Low	0.15		
	24-60	2.0-6.0	0.04-0.07	8.5-9.0	<2	Low	High	Low	0.10		
ASC*	0-6	>20	0.05-0.07	7.9-8.4	<2	Low	Moderate	Low	0.15	3	1
Arada Variant	6-30	>20	0.05-0.07	8.5-9.0	<2	Low	Moderate	Low	0.17		
	30	---	---	---	---	---	---	---	---		
ATA*	0-8	6.0-20	0.05-0.07	7.4-9.0	<2	Low	Moderate	Low	0.15	5	1
Arizo	8-60	>20	0.04-0.06	7.4-9.0	<2	Low	Moderate	Low	0.10		
AVB*, AXC*	0-8	6.0-20	0.05-0.07	7.4-9.0	<2	Low	Moderate	Low	0.10	5	4
Arizo	8-60	>20	0.04-0.06	7.4-9.0	<2	Low	Moderate	Low	0.10		
AYD*	0-5	0.6-2.0	0.14-0.16	>9.0	<4	Low	High	Moderate	0.43	5	7
Arrolime	5-49	0.6-2.0	0.06-0.08	7.9-9.0	>4	Low	High	High	0.32		
	49-60	0.2-0.6	0.17-0.19	6.6-7.8	>4	Moderate	High	High	0.37		
BD*. Badland											
BFD*	0-5	2.0-6.0	0.06-0.11	7.9-9.0	<2	Low	Moderate	Low	0.17	1	2
Bard	5-19	2.0-6.0	0.11-0.13	>7.8	<2	Low	High	Low	0.32		
	19	---	---	---	---	---	---	---	---		
BHC*	0-5	2.0-6.0	0.06-0.11	7.9-9.0	<2	Low	Moderate	Low	0.28	1	4
Bard	5-19	2.0-6.0	0.11-0.13	>7.8	<2	Low	High	Low	0.32		
	19	---	---	---	---	---	---	---	---		
BMD*	0-5	2.0-6.0	0.05-0.10	7.9-8.4	<2	Low	Moderate	Low	0.20	1	5
Bard	5-19	2.0-6.0	0.11-0.13	>7.8	<2	Low	High	Low	0.32		
	19	---	---	---	---	---	---	---	---		
BNB*	0-4	2.0-6.0	0.06-0.11	7.9-9.0	<2	Low	Moderate	Low	0.28	1	4
Bard	4-15	2.0-6.0	0.11-0.13	>7.8	<2	Low	High	Low	0.32		
	15	---	---	---	---	---	---	---	---		
BOB*:											
Bard	0-5	2.0-6.0	0.05-0.10	7.9-8.4	<2	Low	Moderate	Low	0.20	1	5
	5-19	2.0-6.0	0.11-0.13	>7.8	<2	Low	High	Low	0.32		
	19	---	---	---	---	---	---	---	---		
Rough broken land.											

See footnote at end of table.

TABLE 13.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
							Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH	Mmhos/cm						
BRB*:											
Bard	0-4	2.0-6.0	0.06-0.11	7.9-9.0	<2	Low	Moderate	Low	0.28	1	4
	4-15	2.0-6.0	0.11-0.13	>7.8	<2	Low	High	Low	0.32		
	15	---	---	---	---	---	---	---	---		
Tonopah	0-6	6.0-20	0.06-0.08	7.9-9.0	<2	Low	Moderate	Low	0.20	5	4
	6-60	>20	0.03-0.05	8.5-9.0	<4	Low	High	Low	0.10		
BTC*:											
Bitter Spring	0-2	2.0-6.0	0.04-0.08	8.5-9.0	<2	Low	High	Low	0.24	5	8
	2-7	2.0-6.0	0.08-0.12	7.9-9.0	<2	Low	High	Low	0.28		
	7-50	2.0-6.0	0.04-0.08	7.9-8.4	>2	Low	High	High	0.15		
Arizo	0-8	6.0-20	0.05-0.07	7.4-9.0	<2	Low	Moderate	Low	0.10	5	4
	8-60	>20	0.04-0.06	7.4-9.0	<2	Low	Moderate	Low	0.10		
Bu	0-6	0.6-2.0	0.17-0.19	7.9-8.4	2-4	Low	High	Moderate	0.49	5	6
Black Butte	6-20	0.2-0.6	0.15-0.17	7.9-8.4	4-8	Moderate	High	Moderate	0.32		
	20-60	>20	0.05-0.07	7.9-8.4	4-8	Low	High	Moderate	0.17		
Bv	0-6	2.0-6.0	0.17-0.19	7.9-8.4	2-4	Low	High	Moderate	0.49	5	6
Black Butte	6-20	0.2-0.6	0.17-0.19	7.9-8.4	4-8	Moderate	High	Moderate	0.32		
	20-60	>20	0.04-0.09	7.9-8.4	4-8	Low	High	Moderate	0.17		
Bw	0-9	6.0-20	0.08-0.10	8.5-9.0	<8	Low	High	High	0.15	5	2
Bluepoint	9-41	6.0-20	0.08-0.10	7.9-9.0	<8	Low	High	High	0.15		
	41-60	2.0-6.0	0.10-0.12	7.9-9.0	<8	Low	High	High	0.20		
By	0-9	2.0-6.0	0.10-0.12	8.5-9.0	>16	Low	High	High	---	---	3
Bluepoint	9-41	6.0-20	0.08-0.10	7.9-9.0	>16	Low	High	High	---		
	41-60	2.0-6.0	0.10-0.12	7.9-9.0	>8	Low	High	High	---		
Ca	0-6	2.0-6.0	0.12-0.15	7.9-9.0	>4	Low	High	Moderate	0.37	5	3
Calico	6-22	2.0-6.0	0.13-0.17	7.9-9.0	>2	Low	High	Moderate	0.49		
	22-43	0.06-0.2	0.17-0.19	7.9-9.0	>2	High	High	Moderate	0.32		
	43-60	>20	0.04-0.08	7.9-9.0	>2	Low	High	Moderate	0.17		
Cc	0-6	2.0-6.0	0.12-0.15	7.9-8.4	2-4	Low	High	Low	0.37	5	3
Calico	6-22	2.0-6.0	0.13-0.17	7.9-8.4	2-4	Low	High	Low	0.49		
	22-43	0.06-0.2	0.17-0.19	7.9-8.4	2-4	High	High	Low	0.32		
	43-60	>20	0.04-0.08	7.9-8.4	2-4	Low	High	Low	0.17		
Cd	0-6	2.0-6.0	0.12-0.15	7.9-9.0	>4	Low	High	Moderate	0.37	5	3
Calico	6-22	2.0-6.0	0.13-0.17	7.9-9.0	>2	Low	High	Moderate	0.49		
	22-43	0.06-0.2	0.17-0.19	7.9-9.0	>2	High	High	Moderate	0.32		
	43-60	>20	0.04-0.08	7.9-9.0	>2	Low	High	Moderate	0.17		
Cm	0-6	0.2-0.6	0.17-0.19	7.9-9.0	>4	Moderate	High	Moderate	0.32	5	6
Calico	6-22	2.0-6.0	0.13-0.17	7.9-9.0	>2	Low	High	Moderate	0.49		
	22-43	0.06-0.2	0.17-0.19	7.9-9.0	>2	High	High	Moderate	0.32		
	43-60	>20	0.04-0.08	7.9-9.0	>2	Low	High	Moderate	0.17		
Cn	0-9	6.0-20	0.05-0.10	7.9-8.4	<4	Low	High	Low	0.15	5	2
Calico Variant	9-27	2.0-6.0	0.05-0.12	7.9-8.4	<4	Low	High	Low	0.17		
	27-60	0.06-0.2	0.17-0.19	7.9-8.4	<4	High	High	Low	0.32		
Co	0-9	6.0-20	0.05-0.10	>8.4	>8	Low	High	Moderate	0.15	5	2
Calico Variant	9-27	2.0-6.0	0.05-0.12	>8.4	>8	Low	High	Moderate	0.17		
	27-60	0.06-0.2	0.17-0.19	>8.4	>8	High	High	Moderate	0.32		
CTC*:											
Colorock	0-3	0.6-2.0	0.06-0.10	7.9-8.4	<2	Low	High	Low	0.24	1	7
	3-15	2.0-6.0	0.04-0.09	8.5-9.0	<2	Low	High	Low	0.17		
	15-42	---	---	---	---	---	---	---	---		
	42-60	6.0-20	0.04-0.09	7.9-8.4	>4	Low	High	Low	0.17		
Tonopah	0-6	6.0-20	0.04-0.06	7.9-9.0	<2	Low	Moderate	Low	0.10	5	5
	6-60	>20	0.03-0.05	8.5-9.0	<4	Low	High	Low	0.10		

See footnote at end of table.

TABLE 13.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm						
CYB* Crystal Springs	0-1 1-11 11	2.0-6.0 2.0-6.0 ---	0.09-0.11 0.09-0.11 ---	8.5-9.0 8.5-9.0 ---	<2 <2 ---	Low Low ---	High High ---	Low Low ---	0.24 0.28 ---	1	4
Ea Eastland	0-17 17-38 38-60	2.0-6.0 >20 2.0-6.0	0.06-0.09 0.04-0.06 0.06-0.09	7.9-8.4 7.9-8.4 7.9-9.0	<2 <2 <2	Low Low Low	High High High	Low Low Low	0.24 0.15 0.20	5	4
FLC* Flattop	0-5 5-22 22-30 30-60	0.06-0.2 2.0-6.0 2.0-6.0 ---	0.13-0.17 0.06-0.08 0.03-0.06 ---	7.9-9.0 7.9-9.0 7.9-8.4 ---	2-4 >4 >8 ---	Moderate Low Low ---	High High High ---	High High High ---	0.28 0.20 0.17 ---	5	7
GAE*: Garr Rock outcrop.	0-2 2-16 16	2.0-6.0 2.0-6.0 ---	0.04-0.06 0.04-0.06 ---	8.5-9.0 8.5-9.0 ---	<2 <2 ---	Low Low ---	High High ---	Low Low ---	0.17 0.17 ---	1	5
Gd Gila	0-9 9-60	6.0-20 0.6-2.0	0.04-0.07 0.15-0.17	7.9-9.0 7.9-8.4	<4 2-16	Low Low	High High	Low Moderate	0.17 0.49	5	2
Ge Gila	0-9 9-60	0.6-2.0 0.6-2.0	0.15-0.17 0.15-0.17	7.9-8.4 7.9-8.4	<2 2-16	Low Low	High High	Low Moderate	0.49 0.49	5	5
Gf, Gn Gila	0-9 9-60	0.6-2.0 0.6-2.0	0.15-0.17 0.15-0.17	7.9-9.0 7.9-9.0	>16 >4	Low Low	High High	Moderate Moderate	0.49 0.49	5	5
Gm Gila	0-9 9-60	0.6-2.0 0.6-2.0	0.15-0.17 0.15-0.17	7.9-9.0 7.9-8.4	>4 >2	Low Low	High High	Moderate Moderate	0.37 0.49	5	5
Go Glendale	0-8 8-60	6.0-20 0.2-0.6	0.05-0.07 0.17-0.19	7.9-8.4 7.9-8.4	<2 4-16	Low Moderate	High High	Low Moderate	0.17 0.55	5	2
Gr Glendale	0-8 8-60	0.6-2.0 0.2-0.6	0.15-0.17 0.17-0.19	7.9-8.4 7.9-8.4	<2 4-16	Low Moderate	High High	Low Moderate	0.32 0.55	5	5
Gs Glendale	0-9 9-60	0.6-2.0 0.2-0.6	0.15-0.17 0.17-0.19	7.9-8.4 7.9-8.4	>8 >8	Low Moderate	High High	Moderate Moderate	0.32 0.55	5	5
Gv Grapevine	0-10 10-60	0.6-2.0 0.6-2.0	0.16-0.18 0.12-0.15	7.9-9.0 8.5-9.0	2-8 2-8	Low Low	High High	High High	0.43 0.32	5	5
Ir, It Ireteba	0-12 12-60	0.6-2.0 0.6-2.0	0.16-0.18 0.13-0.16	7.9-8.4 7.9-8.4	4-8 >8	Low Low	High High	High High	0.28 0.24	5	5
La Land	0-4 4-60	0.6-2.0 0.2-0.6	0.07-0.10 0.13-0.19	8.5-9.0 7.9-9.0	>16 >16	Low Moderate	High High	High High	0.15 0.37	5	2
Lc, Ld Land	0-4 4-60	0.2-0.6 0.2-0.6	0.15-0.19 0.13-0.19	8.5-9.0 7.9-9.0	>16 >16	Moderate Moderate	High High	High High	0.37 0.37	5	7
MMB* Mormon Mesa	0-2 2-16 16	2.0-6.0 2.0-6.0 ---	0.08-0.10 0.10-0.13 ---	7.9-8.4 8.5-9.0 ---	<2 <2 ---	Low Low ---	High High ---	Low Low ---	0.20 0.32 ---	1	2
MOB* Mormon Mesa	0-2 2-16 16	2.0-6.0 2.0-6.0 ---	0.13-0.15 0.10-0.13 ---	7.9-8.4 8.5-9.0 ---	<2 <2 ---	Low Low ---	High High ---	Low Low ---	0.28 0.32 ---	1	3
NAC*: Nickel	0-7 7-60	2.0-6.0 0.2-0.6	0.06-0.10 0.04-0.08	7.9-9.0 7.9-9.0	<2 <2	Low Low	High High	Low Low	0.17 0.15	5	5
Arizo	0-8 8-60	6.0-20 >20	0.05-0.07 0.04-0.06	7.4-9.0 7.4-9.0	<2 <2	Low Low	Moderate Moderate	Low Low	0.10 0.10	5	4

See footnote at end of table.

TABLE 13.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
							Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH	Mmhos/cm						
NAC*:											
Cave	0-4	0.6-2.0	0.07-0.12	7.9-8.4	2-4	Low	High	Low	0.28	2	---
	4-15	0.6-2.0	0.05-0.08	7.9-8.4	>4	Low	High	Low	0.28		
	15	---	---	---	---	---	---	---	---		
Oc	0-7	0.06-0.2	0.17-0.19	7.9-8.4	<2	High	High	Low	0.28	5	4
Overton	7-25	0.06-0.2	0.17-0.19	7.9-8.4	<2	High	High	Low	0.28		
	25-60	0.06-0.2	0.17-0.19	7.9-8.4	<2	High	High	Low	0.28		
Oe, On, Or	0-7	0.06-0.2	0.17-0.19	7.9-9.0	>4	High	High	High	0.28	5	4
Overton	7-25	0.06-0.2	0.17-0.19	7.9-9.0	>16	High	High	High	0.28		
	25-60	0.06-0.2	0.17-0.19	8.5-9.0	>4	High	High	High	0.28		
Os, Ot	0-11	0.6-2.0	0.19-0.21	8.5-9.0	>4	Low	High	High	0.64	5	6
Overton Variant	11-31	0.6-2.0	0.13-0.15	8.5-9.0	>16	Low	High	High	0.49		
	31-60	0.6-2.0	0.13-0.15	8.5-9.0	>4	Low	High	High	0.32		
PL*.											
Playas											
PME*:											
Pulsipher	0-2	0.6-2.0	0.07-0.12	7.4-8.4	<2	Low	High	Low	0.28	1	6
	2-15	2.0-6.0	0.04-0.08	7.4-8.4	<2	Low	High	Low	0.17		
	15	---	---	---	---	---	---	---	---		
Rock outcrop.											
PPE*:											
Pulsipher	0-2	0.6-2.0	0.07-0.12	7.4-8.4	<2	Low	High	Low	0.28	1	6
	2-15	2.0-6.0	0.04-0.08	7.4-8.4	<2	Low	High	Low	0.17		
	15	---	---	---	---	---	---	---	---		
Pulsipher Variant-	0-6	0.06-0.2	0.13-0.18	7.9-8.4	<2	Moderate	High	Low	0.32	1	7
	6-14	0.06-0.2	0.11-0.15	7.9-8.4	<2	High	High	Low	0.24		
	14	---	---	---	---	---	---	---	---		
PRE*	0-6	0.06-0.2	0.13-0.18	7.9-8.4	<2	Moderate	High	Low	0.32	1	7
Pulsipher Variant	6-14	0.06-0.2	0.11-0.15	7.9-8.4	<2	High	High	Low	0.24		
	14	---	---	---	---	---	---	---	---		
Re*.											
Riverwash											
RME*:											
Rock land.											
Moapa	0-4	>20	0.04-0.07	7.9-8.4	<2	Low	Moderate	Low	0.15	2	1
	4-30	>20	0.04-0.07	8.5-9.0	<2	Low	Moderate	Low	0.17		
	30-36	---	---	---	---	---	---	---	---		
RTF*:											
Rock land.											
St. Thomas	0-2	2.0-6.0	0.05-0.10	7.9-8.4	<2	Low	High	Low	0.24	1	7
	2-12	2.0-6.0	0.04-0.07	7.9-8.4	<2	Low	High	Low	0.24		
	12	---	---	---	---	---	---	---	---		
SP*	0-5	0.06-0.2	0.17-0.19	7.9-8.4	>2	Moderate	High	High	0.37	5	7
Spring	5-43	0.06-0.2	0.17-0.19	6.6-8.4	>4	Moderate	High	High	0.32		
	43-60	0.2-0.6	0.17-0.19	6.6-7.8	>4	Low	High	High	0.55		
Tb	0-13	2.0-6.0	0.10-0.14	7.4-8.4	<2	Low	High	Low	0.28	5	3
Tobler	13-60	2.0-6.0	0.10-0.14	7.4-8.4	<2	Low	High	Low	0.28		
Tc	0-13	0.6-2.0	0.13-0.15	7.9-8.4	>16	Low	High	Moderate	0.32	5	3
Tobler	13-60	2.0-6.0	0.13-0.15	7.9-8.4	>8	Low	High	Moderate	0.32		
Td	0-13	0.2-0.6	0.17-0.19	7.9-8.4	<2	Low	High	Low	0.55	5	6
Tobler	13-60	2.0-6.0	0.13-0.15	7.9-8.4	<2	Low	High	Low	0.32		

See footnote at end of table.

TABLE 13.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
							Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH	Mmhos/cm						
Te	0-13	0.06-0.2	0.17-0.19	7.9-8.4	>16	High	High	Moderate	0.20	5	4
Tobler	13-60	2.0-6.0	0.13-0.15	7.9-8.4	>8	Low	High	Moderate	0.32		
THB*	0-6	6.0-20	0.06-0.08	7.9-9.0	<2	Low	Moderate	Low	0.20	5	4
Tonopah	6-60	>20	0.03-0.05	8.5-9.0	<4	Low	High	Low	0.10		
TMD*	0-6	6.0-20	0.04-0.06	7.9-9.0	<2	Low	Moderate	Low	0.10	5	5
Tonopah	6-60	>20	0.03-0.05	8.5-9.0	<4	Low	High	Low	0.10		
TnA, TnB	0-9	>20	0.04-0.06	8.5-9.0	<2	Low	Moderate	Low	0.15	5	1
Toquop	9-60	>20	0.04-0.06	7.9-9.0	<2	Low	Moderate	Low	0.15		
TsA	0-9	>20	0.04-0.06	8.5-9.0	2-4	Low	High	Low	0.15	5	1
Toquop	9-60	>20	0.04-0.06	7.9-9.0	2-4	Low	High	Low	0.15		
TtA	0-9	2.0-6.0	0.13-0.15	8.5-9.0	<2	Low	Moderate	Low	0.24	5	3
Toquop	9-60	>20	0.04-0.06	7.9-9.0	<2	Low	Moderate	Low	0.15		
TuA	0-9	2.0-6.0	0.13-0.15	8.5-9.0	2-4	Low	High	Low	0.24	5	3
Toquop	9-60	>20	0.04-0.06	7.9-9.0	2-4	Low	High	Low	0.15		
TvA	0-9	0.2-0.6	0.17-0.19	8.5-9.0	4-8	Moderate	High	Moderate	0.37	5	7
Toquop	9-60	>20	0.04-0.06	7.9-9.0	>8	Low	High	Moderate	0.15		
Vd	0-12	2.0-6.0	0.08-0.12	7.4-8.4	<2	Low	Moderate	Low	0.28	5	3
Vinton	12-60	2.0-6.0	0.06-0.08	7.9-8.4	<2	Low	High	Low	0.20		
VEF*:											
Virgin Peak	0-6	2.0-6.0	0.04-0.08	6.6-7.3	<2	Low	High	Low	0.20	1	3
	6-14	---	---	---	---	---	---	---	---		
	14	---	---	---	---	---	---	---	---		
Rock land.											
Vg, Vn	0-6	0.06-0.2	0.15-0.17	7.9-8.4	>2	High	High	Moderate	0.28	5	4L
Virgin River	6-35	0.06-0.2	0.17-0.19	7.9-8.4	>2	High	High	Moderate	0.28		
	35-60	0.2-0.6	0.11-0.14	7.9-8.4	>2	Low	High	Moderate	0.20		
Vr	0-6	0.06-0.2	0.18-0.20	7.9-8.4	>8	High	High	Moderate	0.32	5	7
Virgin River Variant	6-28	0.06-0.2	0.18-0.20	7.9-8.4	>8	High	High	Moderate	0.32		
	28-60	2.0-6.0	0.06-0.08	7.9-8.4	>8	Low	High	Moderate	0.17		
WEE*	0-6	2.0-6.0	0.07-0.09	7.9-8.4	<2	Low	High	Low	0.17	5	5
Weiser	6-60	2.0-6.0	0.04-0.08	7.9-8.4	<2	Low	High	Low	0.17		

* See map unit description for the composition and behavior of the map unit.

TABLE 14.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See text for descriptions of symbols and such terms as "rare," "brief," and "perched." The symbol < means less than; > means greater than]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Cemented pan	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Depth	Hardness
					Ft			In		In	
Ad*. Alluvial land											
Ae---------- Anthony	B	Rare--------	---	---	>6.0	---	---	>60	---	---	---
Af---------- Anthony	B	Occasional	Very brief	Jun-Sep	>6.0	---	---	>60	---	---	---
Ah---------- Anthony	B	Rare--------	---	---	4.0-6.0	Apparent	Mar-Oct	>60	---	---	---
AMC*, AOB*-------- Arada	B	None--------	---	---	>6.0	---	---	>60	---	---	---
ASC*---------- Arada Variant	C	None--------	---	---	>6.0	---	---	>60	---	21-36	Hard
ATA*, AVB*, AXC*-- Arizo	A	Common------	Very brief	Mar-Sep	>6.0	---	---	>60	---	---	---
AYD*---------- Arrolime	C	Rare--------	---	---	>6.0	---	---	>60	---	---	---
BD*. Badland											
BFD*, BHC*, BMD*, BNB*---------- Bard	D	None--------	---	---	>6.0	---	---	>60	---	14-20	Hard
BOB*: Bard---------- Rough broken land.	D	None--------	---	---	>6.0	---	---	>60	---	14-20	Hard
BRB*: Bard---------- Tonopah----------	D A	None-------- Rare--------	--- ---	--- ---	>6.0 >6.0	--- ---	--- ---	>60 >60	--- ---	14-20 ---	Hard ---
BTC*: Bitter Spring---- Arizo----------	B A	None-------- Common------	--- Very brief	--- Mar-Sep	>6.0 >6.0	--- ---	--- ---	>60 >60	--- ---	--- ---	--- ---
Bu---------- Black Butte	B	Rare--------	---	---	>6.0	---	---	>60	---	---	---
Bv---------- Black Butte	B	Rare--------	---	---	4.0-5.0	Apparent	Mar-Sep	>60	---	---	---
Bw---------- Bluepoint	A	Rare--------	---	---	>6.0	---	---	>60	---	---	---
By---------- Bluepoint	A	Rare--------	---	---	4.0-5.0	Apparent	Oct-Apr	>60	---	---	---
Ca---------- Calico	C	Occasional	Very brief	Jun-Sep	3.0-4.0	Apparent	Oct-May	>60	---	---	---

See footnote at end of table.

TABLE 14.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Cemented pan	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Depth	Hardness
					Ft			In		In	
Cc---------- Calico	C	Occasional	Very brief	Jun-Sep	>6.0	---	---	>60	---	---	---
Cd, Cm---------- Calico	C	Occasional	Very brief	Jun-Sep	3.0-4.0	Apparent	Oct-May	>60	---	---	---
Cn---------- Calico Variant	C	Occasional	Very brief	Jun-Sep	>6.0	---	---	>60	---	---	---
Co---------- Calico Variant	C	Occasional	Very brief	Jun-Sep	3.0-4.0	Apparent	Oct-May	>60	---	---	---
CTC*:											
Colorock---------	D	Rare--------	---	---	>6.0	---	---	>60	---	12-20	Hard
Tonopah----------	A	Rare--------	---	---	>6.0	---	---	>60	---	---	---
CYB*---------- Crystal Springs	D	Rare--------	---	---	>6.0	---	---	>60	---	11-20	Hard
Ea---------- Eastland	B	Rare--------	---	---	>6.0	---	---	>60	---	---	---
FLC*---------- Flattop	D	Rare--------	---	---	>6.0	---	---	>60	---	30-60	Rippable
GAE*:											
Garr----------	D	None--------	---	---	>6.0	---	---	12-20	Hard	---	---
Rock outcrop.											
Gd, Ge, Gf-------- Gila	B	Occasional	Very brief	Jun-Sep	>6.0	---	---	>60	---	---	---
Gm, Gn---------- Gila	B	Occasional	Very brief	Jun-Sep	4.0-5.0	Apparent	Mar-Oct	>60	---	---	---
Go, Gr, Gs-------- Glendale	B	Occasional	Very brief	Jun-Sep	>6.0	---	---	>60	---	---	---
Gv---------- Grapevine	B	Rare--------	---	---	>6.0	---	---	>60	---	---	---
Ir---------- Ireteba	B	Rare--------	---	---	>6.0	---	---	>60	---	---	---
It----------	B	Common------	Brief-----	Mar-Oct	>6.0	---	---	>60	---	---	---
La---------- Land	B	Rare--------	---	---	4.0-6.0	Apparent	Mar-Sep	>60	---	---	---
Lc----------	B	Common------	Very brief	Jun-Sep	4.0-6.0	Apparent	Mar-Sep	>60	---	---	---
Ld---------- Land	B	Occasional	Very brief	Jun-Sep	2.0-4.0	Apparent	Jan-Dec	>60	---	---	---
MMB*, MOB*-------- Mormon Mesa	D	None--------	---	---	>6.0	---	---	>60	---	7-20	Hard
NAC*:											
Nickel----------	B	None--------	---	---	>6.0	---	---	>60	---	---	---
Arizo----------	A	Common------	Very brief	Mar-Sep	>6.0	---	---	>60	---	---	---
Cave----------	D	None--------	---	---	>6.0	---	---	>60	---	4-20	Rippable
Oc---------- Overton	D	Rare--------	---	---	3.0-6.0	Apparent	Jan-Dec	>60	---	---	---

See footnote at end of table.

TABLE 14.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Cemented pan	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Depth	Hardness
					Ft			In		In	
Oe, On, Or---------- Overton	D	Rare---------	---	---	1.0-6.0	Apparent	Jan-Dec	>60	---	---	---
Os---------- Overton Variant	C	Rare---------	---	---	3.0-5.0	Apparent	Jan-Dec	>60	---	---	---
Ot---------- Overton Variant	C	Occasional	Very brief	Jun-Sep	3.0-5.0	Apparent	Jan-Dec	>60	---	---	---
PL*. Playas											
PME*: Pulsipher---------	D	None---------	---	---	>6.0	---	---	12-20	Hard	---	---
Rock outcrop.											
PPE*: Pulsipher---------	D	None---------	---	---	>6.0	---	---	12-20	Hard	---	---
Pulsipher Variant	D	None---------	---	---	>6.0	---	---	12-20	Hard	---	---
PRE*---------- Pulsipher Variant	D	None---------	---	---	>6.0	---	---	12-20	Hard	---	---
Re*. Riverwash											
RME*: Rock land.											
Moapa----------	C	None---------	---	---	>6.0	---	---	20-40	Hard	---	---
RTF*: Rock land.											
St. Thomas-------	D	None---------	---	---	>6.0	---	---	4-20	Hard	---	---
SP*---------- Spring	C	Rare---------	---	---	>6.0	---	---	>60	---	---	---
Tb---------- Tobler	B	Occasional	Very brief	Jan-Sep	>6.0	---	---	>60	---	---	---
Tc---------- Tobler	B	Occasional	Very brief	Jun-Sep	2.0-5.0	Apparent	Oct-Mar	>60	---	---	---
Td---------- Tobler	B	Occasional	Very brief	Jun-Sep	4.0-5.0	Apparent	Oct-Mar	>60	---	---	---
Te---------- Tobler	B	Occasional	Very brief	Jun-Sep	2.0-5.0	Apparent	Oct-Mar	>60	---	---	---
THB*, TMD*-------- Tonopah	A	Rare---------	---	---	>6.0	---	---	>60	---	---	---
TnA, TnB---------- Toquop	A	Rare---------	---	---	>6.0	---	---	>60	---	---	---
TsA---------- Toquop	A	Rare---------	---	---	4.0-6.0	Apparent	Oct-Mar	>60	---	---	---
TtA---------- Toquop	A	Rare---------	---	---	>6.0	---	---	>60	---	---	---
TuA, TvA---------- Toquop	A	Rare---------	---	---	4.0-6.0	Apparent	Oct-Mar	>60	---	---	---

See footnote at end of table.

TABLE 14.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Cemented pan	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Depth	Hardness
					Ft			In		In	
Vd Vinton	B	Rare	---	---	>6.0	---	---	>60	---	---	---
VEF*: Virgin Peak	D	None	---	---	>6.0	---	---	13-20	Hard	---	---
Rock land.											
Vg, Vn Virgin River	C	Occasional	Very brief	Mar-Oct	4.0-6.0	Apparent	Mar-Oct	>60	---	---	---
Vr Virgin River Variant	D	Occasional	Very brief	Mar-Oct	1.5-3.0	Apparent	Mar-Oct	>60	---	---	---
WEE* Weiser	B	None	---	---	>6.0	---	---	>60	---	---	---

* See map unit description for the composition and behavior of the map unit.

TABLE 15.--ENGINEERING TEST DATA

[The symbol > means more than]

Soil name and location	Parent material	Depth	Horizon	Fragments >3 inches	Mechanical analysis: Percentage passing sieve 3	1-1/2	3/4	No. 4	No. 10	No. 40	No. 200	Liquid limit	Plasticity index	Classification: AASHTO	Unified
		In		Pct	In	In	In								
Arada fine sand:															
1,000 feet south and 350 feet east of northwest corner, sec. 26, T. 15 S., R. 67 E.	Eolian sand.	6-16	C2	--	---	---	---	100	99	95	10	16	NP*	A-3(0)	SP-SM
		27-37	IIC4Ca	--	---	---	100	95	93	86	12	20	NP	A-2-4(0)	SP-SM
1,750 feet south and 250 feet west of north quarter corner, sec. 1, T. 17 S., R. 67 E.	Eolian sand.	3-17	C1	--	---	---	100	98	97	90	11	16	NP	A-2-4(0)	SP-SM
		17-24	IIC2	--	---	---	100	88	85	76	20	21	NP	A-2-4(0)	SM
Arizo gravelly fine sand:															
2 miles southwest of Bunkerville Post Office, 200 feet north of "Old" Hwy 91 and 0.5 mile northeast of Bunkerville Park.	Mixed alluvium	4-36	C1	10	100	89	84	59	44	17	4	16	NP	A-1-a(0)	SP
		36-60+	C2	20	100	93	71	44	34	17	5	18	NP	A-1-a(0)	GW-GM
NW1/4SW1/4 of sec. 20, T. 13 S., R. 71 E.	Mixed alluvium	7-14	C1	10	100	96	87	64	50	20	3	20	NP	A-1-a(0)	SP
		14-22+	C2	25	100	71	55	37	30	25	14	18	NP	A-1-a(0)	GM
Bitter Spring very gravelly loam:															
1.3 miles west of Mesquite Post Office on Hwy 91 and 4.2 miles southwest on "Old" Hwy 91, 350 feet northwest of Bunkerville Park.	Mixed alluvium	7-14	C1ca	--	---	100	90	75	64	49	26	28	12	A-2-6(0)	SC
		14-22+	IIC2	5	100	98	84	55	43	27	13	20	NP	A-1-a(0)	GM
1.3 miles west of Mesquite Post Office on Hwy 91, 8.8 miles west on "Old" Hwy 91 to Riverside bridge and 1.4 miles west; 200 feet south of road and 0.3 mile east of Bundy ranchhouse.	Mixed alluvium	4 1/2 to 15	B3ca	--	100	96	79	63	54	41	16	24	9	A-2-4(0)	SC
		18-27+	C2	--	100	98	92	75	64	47	16	21	NP	A-1-b(0)	SM
Black Butte silt loam:															
1,170 feet north and 200 feet east of south quarter corner, sec. 17, T. 13 S., R. 71 E.	Mixed alluvium	6-16	C1	--	---	---	---	---	100	98	75	27	14	A-6(0)	CL
		20-60+	IIC3	--	---	---	---	---	100	98	11	18	NP	A-2-4(0)	SP-SM
75 feet west and 75 feet south of northeast corner of field, 0.25 mile south of Western Village along Pulsipher Lane.	Mixed alluvium	3-12	C1	--	---	---	---	---	100	98	65	24	10	A-4(6)	CL
		21-60+	IIC3	--	---	---	---	---	100	96	17	16	NP	A-2-4(0)	SM

See footnote at end of table.

TABLE 15.--ENGINEERING TEST DATA--Continued

Soil name and location	Parent material	Depth	Horizon	Frag-ments >3 inches	Mechanical analysis: Percentage passing sieve: 3	1-1/2	3/4	No. 4	No. 10	No. 40	No. 200	Liquid limit	Plas-ticity index	Classification: AASHTO	Unified
		In		Pct	In	In	In								
Bluepoint loamy fine sand:															
330 feet east and 250 feet north of west quarter corner, sec. 2, T. 16 S., R. 68 E.	Mixed alluvium	9-17	C1	--	---	---	---	---	---	100	23	18	NP	A-2-4(0)	SM
		17-30	C2	--	---	---	---	---	---	100	7	18	NP	A-3(0)	SP-SM
2 miles south of Overton on George Ishamato ranch.	Mixed alluvium	0-5	Ap	--	---	---	---	---	100	99	47	20	4	A-4(2)	SM-SC
		17-25	C3	--	---	---	---	---	100	97	10	17	NP	A-3(0)	SP-SM
Calico fine sandy loam:															
1,500 feet west and 660 feet south of northeast corner, sec. 2, T. 17 S., R. 67 E.	Mixed alluvium	6-15	C1	--	---	---	---	---	---	100	55	21	NP	A-4(4)	ML
		15-22	C2	--	---	---	---	---	---	100	78	26	NP	A-4(8)	ML
100 feet south and 75 feet west of north quarter corner, sec. 27, T. 16 S., R. 67 E.	Mixed alluvium	4-12	C1	--	---	---	---	---	100	99	36	19	NP	A-4(0)	SM
		17-30	C3	--	---	---	100	98	97	96	89	29	NP	A-4(8)	ML
Glendale loam:															
800 feet west and 660 feet north of southeast corner, sec. 14, T. 14 S., R. 65 E.	Mixed alluvium	2-9	C1	--	---	---	100	99	98	95	68	20	NP	A-4(7)	ML
		9-24	C2	--	---	---	100	98	97	94	47	19	NP	A-4(2)	SM
50 feet west and 400 feet north of east quarter corner, sec. 15, T. 14 S., R. 65 E.	Mixed alluvium	9-16	C2	--	---	---	---	---	---	100	46	19	NP	A-4(2)	SM
		16-20	C3	--	---	---	---	---	---	100	83	28	15	A-6(10)	CL
Overton silty clay:															
2,000 feet south and 1,700 feet west of northeast corner, sec. 2, T. 17 S., R. 67 E.	Mixed alluvium	6-12	A1	--	---	---	---	100	99	95	89	58	37	A-7-6 (20)	CH
		19-24	C2g	--	---	---	---	---	---	100	98	53	33	A-7-6 (19)	CH
400 feet north and 100 feet east of the center of sec. 22, T. 15 S., R. 67 E.	Mixed alluvium	7-16	A1	--	---	---	---	---	100	89	74	55	32	A-7-6 (19)	CH
		30-48+	C4	--	---	---	---	---	---	100	97	41	24	A-7-6 (14)	CL
Tonopah gravelly sandy loam:															
1 mile east of Logandale Post Office and 1 mile northwest of Overton Airport.	Mixed alluvium	2-17	C1ca	10	100	91	74	45	31	9	2	24	NP	A-1-a(0)	GW
		35-60+	C3	15	100	90	69	42	34	15	1	20	NP	A-1-a(0)	GW
1,600 feet east and 1,900 feet west of northeast corner, sec. 13, T. 13 S., R. 65 E.	Mixed alluvium	6-14	C1ca	15	100	82	61	37	28	16	6	20	NP	A-1-a(0)	GW-GM
		14-33	C2ca	20	100	77	56	35	26	11	2	20	NP	A-1-a(0)	GW
Toquop fine sand:															
3.1 miles west of Mesquite Post Office and 200 feet southeast of Hwy 91	Mixed alluvium	9-26	C1	--	---	---	---	---	100	95	8	17	NP	A-3(0)	SP-SM
		26-43	C2	--	---	---	---	---	100	99	9	19	NP	A-3(0)	SP-SM

See footnote at end of table.

TABLE 15.--ENGINEERING TEST DATA--Continued

Soil name and location	Parent material	Depth	Horizon	Fragments >3 inches	Mechanical analysis: Percentage passing sieve 3	1-1/2	3/4	No. 4	No. 10	No. 40	No. 200	Liquid limit	Plasticity index	Classification: AASHTO	Unified
		In		Pct	In	In	In								
Tonopah fine sand:															
400 feet east and 1,300 feet south of north quarter corner, sec. 15, T. 13 S., R. 71 E.	Mixed alluvium	6-25	C1	--	---	---	---	---	100	98	14	18	NP	A-2-4(0)	SM
		25-32	C2	--	---	---	---	---	100	98	13	16	NP	A-2-4(0)	SM
Virgin River silty clay:															
1,100 feet north and 100 feet west of southeast corner, sec. 26, T. 13 S., R. 70 E.	Mixed alluvium	6-20	C1	--	---	---	---	100	99	95	85	43	25	A-7-6 (15)	CL
		20-31	C2	--	---	---	---	---	100	99	97	36	15	A-6(10)	CL
500 feet north of south quarter corner, sec. 16, T. 13 S., R. 70 E.	Mixed alluvium	6-26	C1 & C2	--	---	---	---	---	100	97	93	50	33	A-7-6 (18)	CL
		26-35	C3	--	---	---	---	---	100	99	82	22	6	A-4(8)	ML-CL

*NP - nonplastic.

TABLE 16.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Anthony	Coarse-loamy, mixed (calcareous), thermic Typic Torrifluvents
Arada	Sandy, mixed, thermic Typic Calciorthids
Arada Variant	Sandy, mixed, thermic Typic Paleorthids
Arizo	Sandy-skeletal, mixed, thermic Typic Torriorthents
Arrolime	Loamy-skeletal, mixed, thermic Cambic Gypsiorthids
Bard	Loamy, carbonatic, thermic, shallow Typic Paleorthids
Bitter Spring	Loamy-skeletal, mixed, thermic Typic Haplargids
Black Butte	Fine-loamy over sandy or sandy-skeletal, mixed (calcareous), thermic Typic Torriorthents
Bluepoint	Mixed, thermic Typic Torripsamments
Calico	Coarse-loamy over clayey, mixed (calcareous), thermic Aquic Xerofluvents
Calico Variant	Sandy over clayey, mixed (calcareous), thermic Aquic Xerofluvents
Cave	Loamy, mixed, thermic, shallow Typic Paleorthids
Colorock	Loamy-skeletal, mixed, thermic, shallow Petrocalcic Paleargids
Crystal Springs	Loamy, carbonatic, mesic, shallow Typic Paleorthids
Eastland	Sandy-skeletal, mixed, thermic Typic Calciorthids
Flattop	Loamy-skeletal, mixed, thermic Typic Natrargids
Garr	Loamy-skeletal, mixed, thermic Lithic Camborthids
Gila	Coarse-loamy, mixed (calcareous), thermic Typic Torrifluvents
Glendale	Fine-silty, mixed (calcareous), thermic Typic Torrifluvents
Grapevine	Coarse-loamy, mixed, thermic Typic Calciorthids
Ireteba	Coarse-loamy, mixed (calcareous), thermic Typic Torrifluvents
Land	Fine-silty, mixed, thermic Typic Salorthids
Moapa	Mixed, thermic Typic Torripsamments
Mormon Mesa	Loamy, carbonatic, thermic, shallow Typic Paleorthids
Nickel	Loamy-skeletal, mixed, thermic Typic Calciorthids
Overton	Fine, montmorillonitic (calcareous), thermic Aeric Haplaquepts
Overton Variant	Coarse-loamy, mixed, thermic Fluvaquentic Haplustolls
Pulsipher	Loamy-skeletal, mixed, mesic Lithic Xerollic Camborthids
Pulsipher Variant	Clayey, montmorillonitic, thermic Lithic Ustollic Haplargids
Spring	Fine-loamy, mixed, thermic Cambic Gypsiorthids
St. Thomas	Loamy-skeletal, carbonatic, thermic Lithic Torriorthents
Tobler	Coarse-loamy, mixed (calcareous), thermic Typic Torrifluvents
Tonopah	Sandy-skeletal, mixed, thermic Typic Calciorthids
Toquop	Mixed, thermic Typic Torripsamments
Vinton	Sandy, mixed, thermic Typic Torrifluvents
Virgin Peak	Loamy-skeletal, mixed, mesic Lithic Haploxerolls
Virgin River	Fine-loamy, mixed (calcareous), thermic Aquic Torriorthents
Virgin River Variant	Fine-silty over sandy or sandy-skeletal, mixed (calcareous), thermic Aeric Halaquepts
Weiser	Loamy-skeletal, carbonatic, thermic Typic Calciorthids

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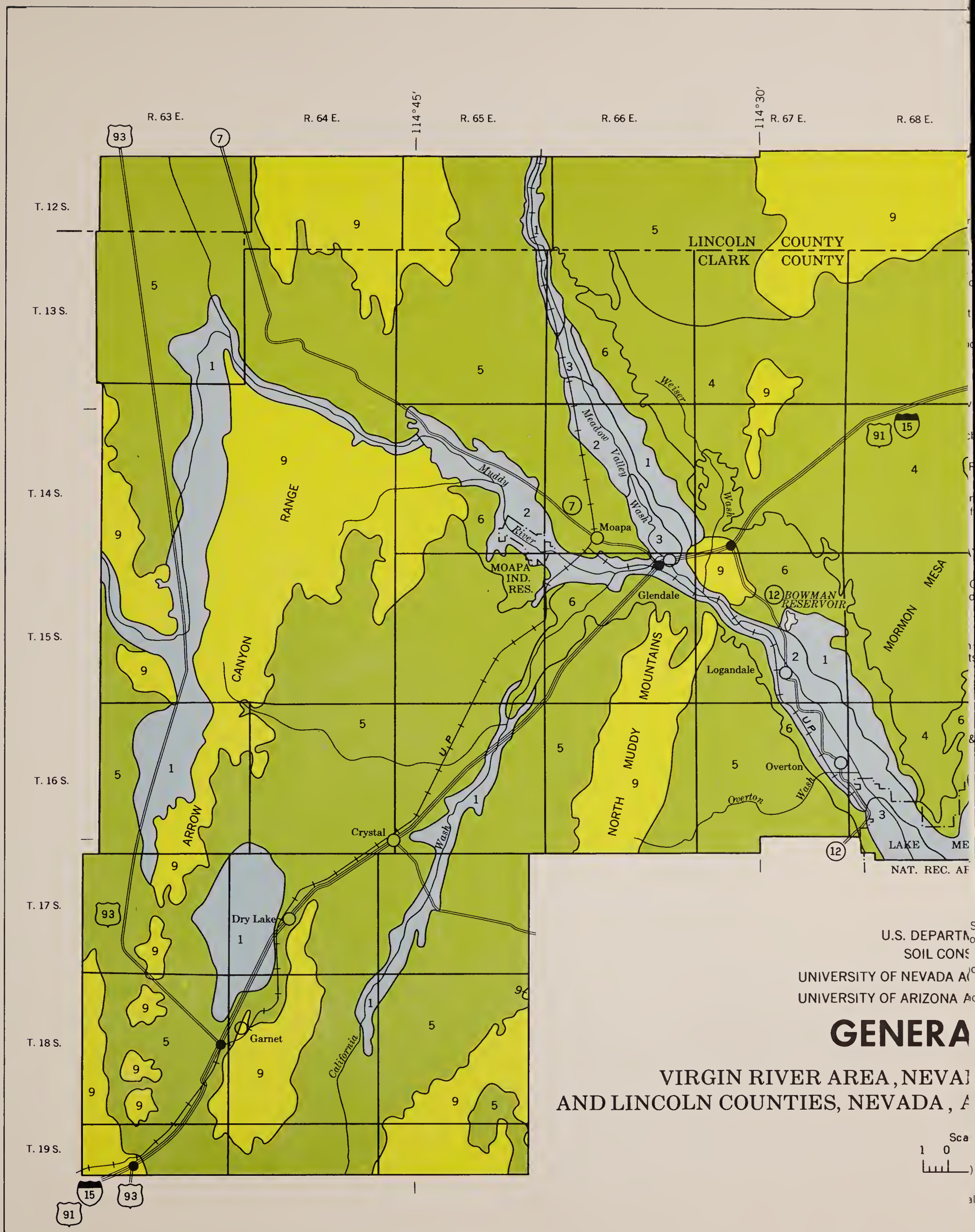

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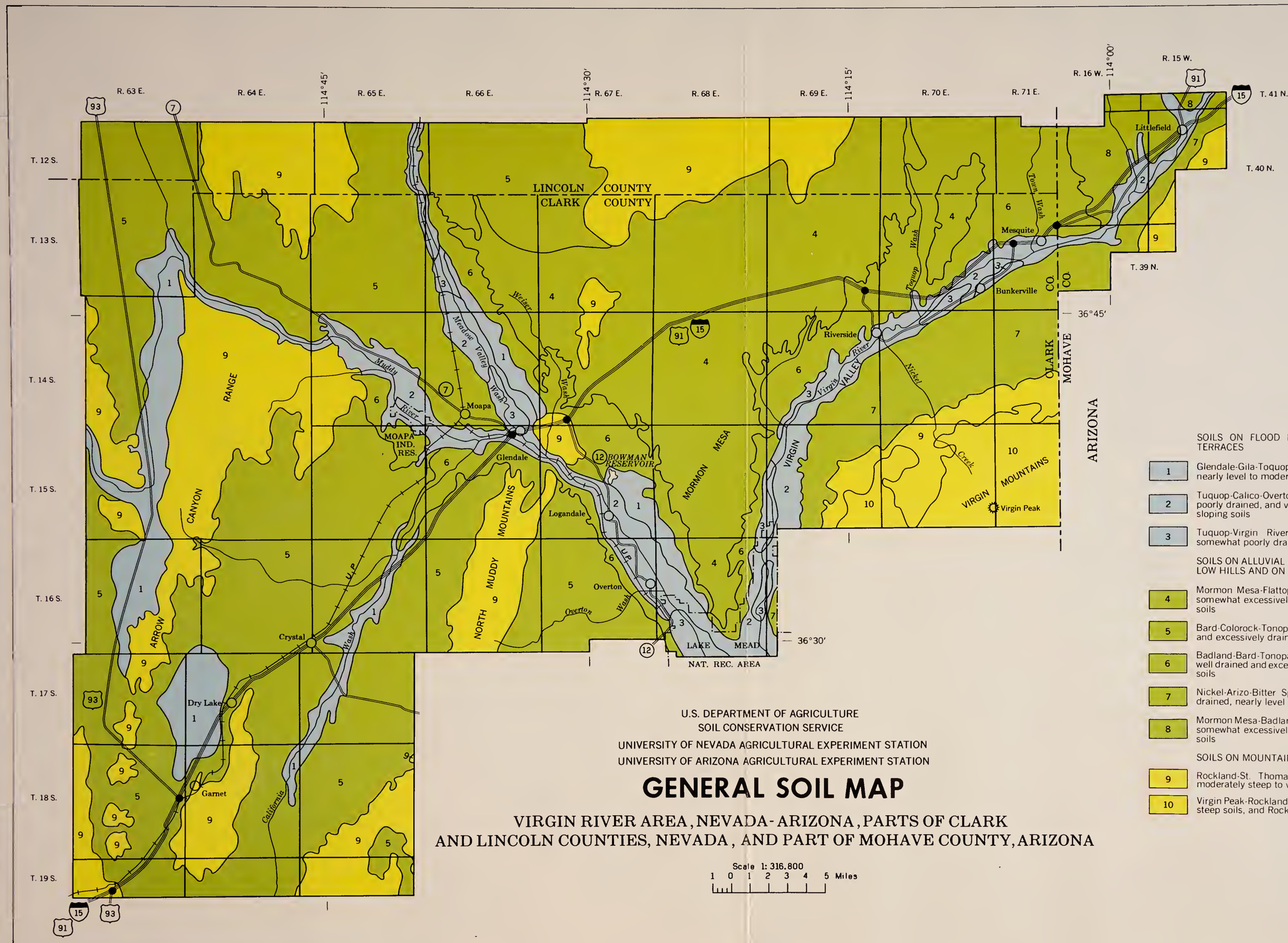

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GENERAL SOIL MAP

VIRGIN RIVER AREA, NEVADA-ARIZONA, PARTS OF CLARK AND LINCOLN COUNTIES, NEVADA, AND PART OF MOHAVE COUNTY, ARIZONA

Scale 1: 316,800
1 0 1 2 3 4 5 Miles

MAP UNITS

SOILS ON FLOOD PLAINS, LOW ALLUVIAL FANS, AND LOW TERRACES

1 — Glendale-Gila-Toquop: Deep, well drained and excessively drained, nearly level to moderately sloping soils

2 — Tuquop-Calico-Overton: Deep, excessively drained, somewhat poorly drained, and very poorly drained, nearly level to moderately sloping soils

3 — Tuquop-Virgin River-Land: Deep, excessively drained and somewhat poorly drained, nearly level soils

SOILS ON ALLUVIAL FANS, DISSECTED TERRACES, BREAKS, AND LOW HILLS AND ON MORMON MESA

4 — Mormon Mesa-Flattop-Arada: Shallow to deep, well drained and somewhat excessively drained, nearly level to moderately sloping soils

5 — Bard-Colorock-Tonopah: Moderately deep and deep, well drained and excessively drained, nearly level to strongly sloping soils

6 — Badland-Bard-Tonopah: Badland, and moderately deep and deep, well drained and excessively drained, nearly level to strongly sloping soils

7 — Nickel-Arizo-Bitter Spring: Deep, well drained and excessively drained, nearly level to steep soils

8 — Mormon Mesa-Badland-Arada: Shallow and deep, well drained and somewhat excessively drained, nearly level to moderately sloping soils

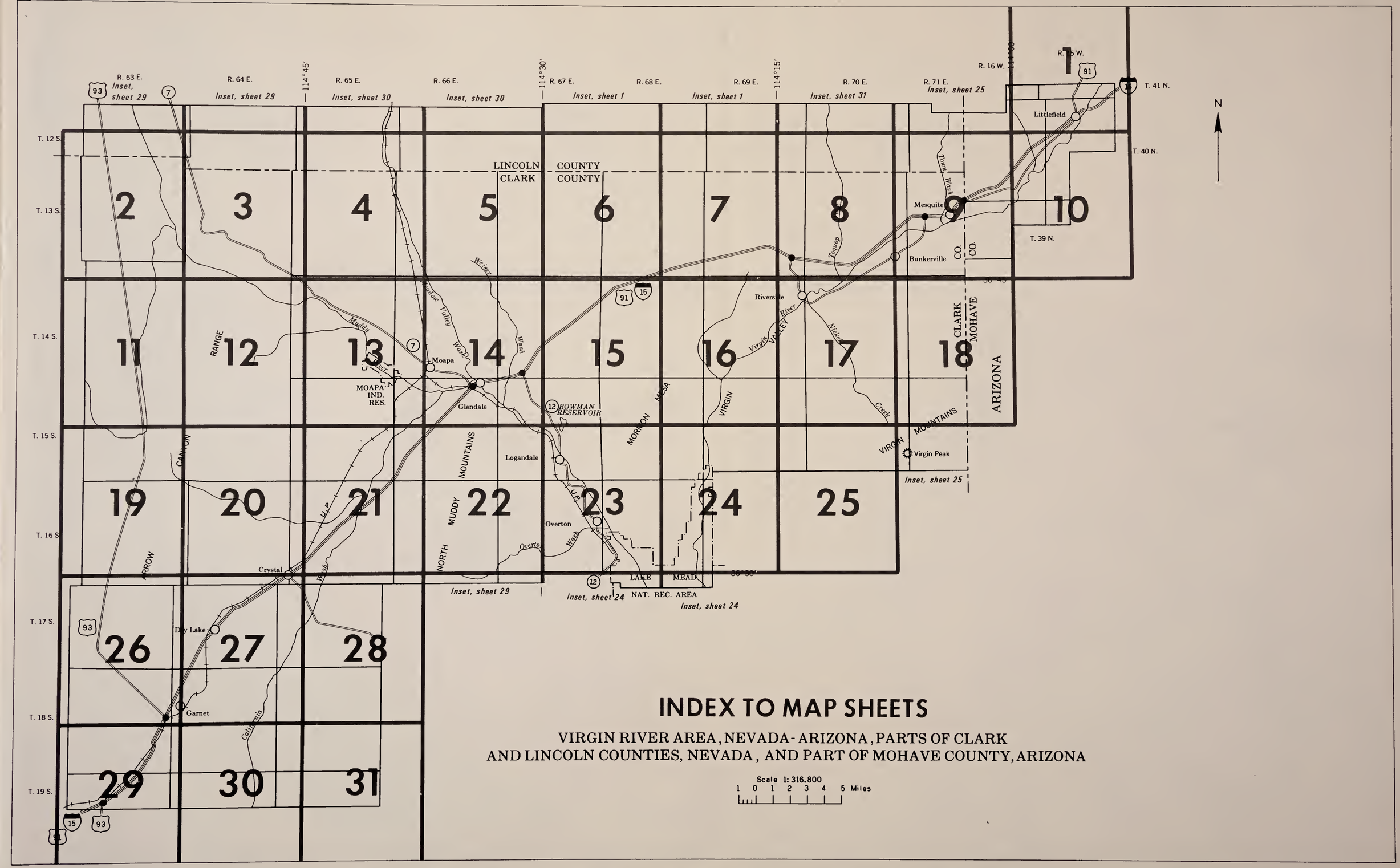
SOILS ON MOUNTAINS, FOOTHILLS, AND FANS

9 — Rockland-St. Thomas: Rockland, and shallow, well drained, moderately steep to very steep soils

10 — Virgin Peak-Rockland: Shallow and deep, well drained, steep to very steep soils, and Rockland

Compiled 1979

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for generat planning rather than a basis for decisions on the use of specitic tracts.



INDEX TO MAP SHEETS

VIRGIN RIVER AREA, NEVADA-ARIZONA, PARTS OF CLARK AND LINCOLN COUNTIES, NEVADA, AND PART OF MOHAVE COUNTY, ARIZONA

Scale 1:316,800

1 0 1 2 3 4 5 Miles

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

VIRGIN RIVER AREA, NEVADA-ARIZONA, PARTS OF CLARK AND LINCOLN COUNTIES, NEVADA, AND PART OF MOHAVE COUNTY, ARIZONA

UNIVERSITY OF NEVADA AGRICULTURAL EXPERIMENT STATION
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SOIL LEGEND

SYMBOL	NAME
Ad	Alluvial land
Ae	Anthony fine sandy loam
Af	Anthony fine sandy loam, gravelly substratum
Ah	Anthony fine sandy loam, water table
AMC	Arada fine sand, 2 to 8 percent slopes
AOB	Arada fine sand, gravelly substratum, 0 to 4 percent slopes
ASC	Arada fine sand, hardpan variant, 2 to 8 percent slopes
ATA	Arizo fine sand, 0 to 2 percent slopes
AVB	Arizo gravelly fine sand, 2 to 4 percent slopes
AXC	Arizo very gravelly loamy sand, 2 to 8 percent slopes
AYD	Arrolime gravelly silt loam, 2 to 15 percent slopes
BD	Badland
BFD	Bard gravelly fine sand, 4 to 15 percent slopes
BHC	Bard gravelly fine sandy loam, 2 to 8 percent slopes
BMD	Bard very gravelly fine sandy loam, 2 to 15 percent slopes
BNB	Bard very stony loam, 2 to 4 percent slopes
BOB	Bard-Rough broken land association, gently sloping
BRB	Bard-Tonopah association, gently sloping
BTC	Bitter Spring-Arizo association, moderately sloping
Bu	Black Butte silt loam
Bv	Black Butte silt loam, water table
Bw	Bluepoint loamy fine sand
By	Bluepoint fine sandy loam, strongly saline
Ca	Calico fine sandy loam
Cc	Calico fine sandy loam, drained
Cd	Calico fine sandy loam, strongly saline
Cm	Calico clay loam
Cn	Calico loamy fine sand, coarse variant, drained
Co	Calico loamy fine sand, coarse variant, strongly saline
CTC	Colorock-Tonopah association, moderately sloping
CYB	Crystal Springs gravelly sandy loam, 2 to 4 percent slopes
Ea	Eastland gravelly sandy loam
FLC	Flattop gravelly clay loam, 2 to 8 percent slopes
GAE	Garr-Rock outcrop complex, 15 to 30 percent slopes
Gd	Gila fine sand
Ge	Gila loam
Gf	Gila loam, strongly saline
Gm	Gila loam, water table
Gn	Gila loam, water table, strongly saline
Go	Glendale fine sand
Gr	Glendale loam
Gs	Glendale loam, strongly saline
Gv	Grapevine loam
Ir	Ireteba loam
It	Ireteba loam, overflow
La	Land loamy fine sand
Lc	Land silty clay loam
Ld	Land silty clay loam, wet
MMB	Mormon Mesa loamy fine sand, 0 to 4 percent slopes
MOB	Mormon Mesa fine sandy loam, 0 to 8 percent slopes
NAC	Nickel-Arizo association, rolling
Oc	Overton silty clay
Oe	Overton silty clay, slightly saline
On	Overton silty clay, strongly saline
Or	Overton clay, overwash, saline
Os	Overton silt loam, loamy variant, slightly saline
Ot	Overton silt loam, loamy variant, strongly saline
PL	Playas
PME	Pulsipher-Rock outcrop complex, 15 to 30 percent slopes
PPE	Pulsipher association, hilly
PRE	Pulsipher gravelly clay loam, fine variant, 15 to 30 percent slopes
Re	Riverwash
RME	Rock land-Moapa association, hilly
RTF	Rock land-St. Thomas association, very steep
SP	Spring silty clay loam
Tb	Tobler fine sandy loam
Tc	Tobler fine sandy loam, strongly saline
Td	Tobler silt loam, wet
Te	Tobler clay, strongly saline
THB	Tonopah gravelly sandy loam, 0 to 4 percent slopes
TMD	Tonopah very gravelly sandy loam, 4 to 15 percent slopes
TnA	Toquop fine sand, 0 to 2 percent slopes
TnB	Toquop fine sand, 2 to 8 percent slopes
TsA	Toquop fine sand, water table, 0 to 2 percent slopes
TtA	Toquop fine sandy loam, 0 to 2 percent slopes
TuA	Toquop fine sandy loam, water table, 0 to 2 percent slopes
TvA	Toquop silty clay loam, strongly saline, 0 to 2 percent slopes
Vd	Vinton fine sandy loam
VEF	Virgin Peak-Rock land association, very steep
Vg	Virgin River silty clay
Vn	Virgin River silty clay, strongly saline
Vr	Virgin River silty clay loam, wet variant
WEE	Weiser cobbly sandy loam, 15 to 30 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool (Davis Airstrip; FLOOD POOL LINE)

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate (15)
- Federal (410)
- State (52)
- County, farm or ranch (378)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (water; w)

PITS

- Gravel pit (G.P.)
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (GAS)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water; w)
- Intermittent (int; i)

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS (SvE 107)

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown) (S)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot
- Borrow pit (B.P.)
- Glacial till